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Railway Age

DAILY EDITION

FIRST HALF OF 1923—No. 14 CHICAGO—FRIDAY, MARCH 16, 1923—NEW YORK SIXTY-EIGHTH YEAR

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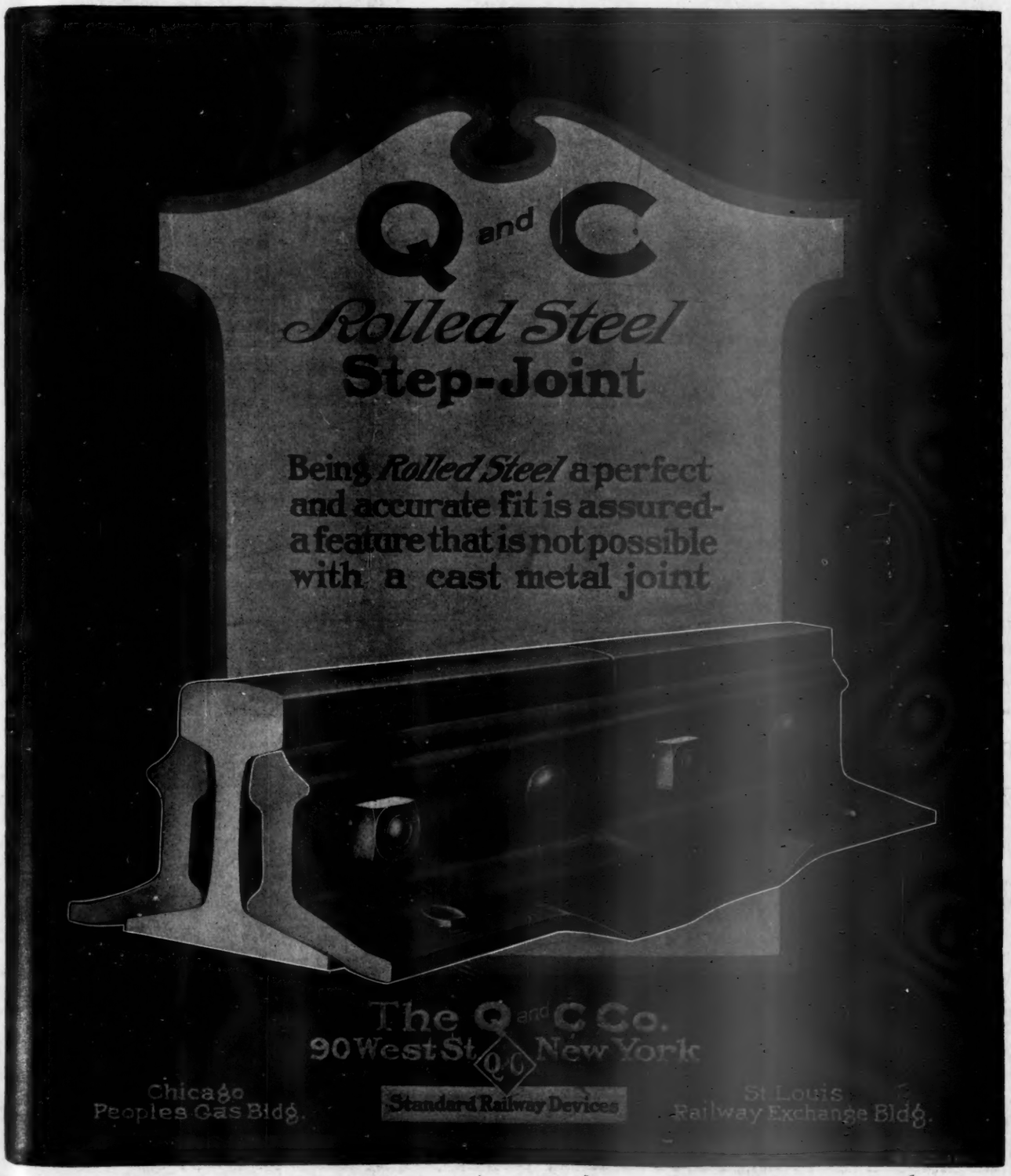
Q and C
Rolled Steel
Step-Joint
Being Rolled Steel a perfect and accurate fit is assured- a feature that is not possible with a cast metal joint
The Q and C Co.
90 West St New York
Chicago Peoples Gas Bldg.
Q C
Standard Railway Devices
St Louis Railway Exchange Bldg.

while when the car is being dumped the apron on the dumping side moves out automatically, causing the load to be thrown beyond the ballast line. When in the dumping position the effect is that of extending the floor 28 in. during which the apron lies in a plane parallel to the car floor. When the car is righted the aprons move back into the vertical position, all movements taking place automatically with that of the dump car.

An Interesting Record of Motor Car Operation

SLIGHTLY MORE THAN A YEAR ago there was introduced in railway service by the Fairmont Gas Engine & Railway Motor Car Company, Fairmont, Minn. (now the Fairmont Motors, Inc.), a four horsepower inspection car carrying the name "Safety-Quick," which, aside from the center load feature, had as its prominent characteristics, (1) the unusually light weight of 385 lb.,

The "Safety Quick" Car on the A. B. & A.

thereby allowing it to be handled by one man; (2) a knockdown feature of construction whereby the power unit might readily be separated from the truck for shipment; (3) a spring mounting of the power unit to absorb the effect of bumping or vibration of the car during motion, and (4) safety guards on all four wheels. The car also embodies the feature of reinforced steel frame construction with wooden disc wheels and a cooling system of the automobile condensing type.

This car aroused considerable interest following its introduction and since that time has produced a number of interesting performance records in actual service. Recently performance data of unusual interest concerning the car has been afforded in a record disclosed by the Alabama, Birmingham & Atlantic in connection with one of these cars used by E. H. Pudney, signal engineer, and other officers for inspection work.

Immediately upon placing the car in service in February, 1922, the plan was instituted of obtaining records both of the number of miles traveled per day and the daily consumption of gasoline. This plan was followed until the end of January 1923, and gave these results:

Month—	Gals. Gasoline	Mileage
February	9.5	486
March	9	473
April	12	606
May	10	523
June	4	212
July	9.3	479
August	11	575
September	11.6	616
October	14	726
November	11.1	600
December	13	675
January	15	778
	129.5	6749

The car has thus been run 6,749 miles with a record of 52.11 miles per gal. of gasoline. The car carried an average of two men during the period and on occasions carried as many as four men over two per cent grades. Also during the period several non-stop runs of 125 miles were made.

A New Sand Dryer

THERE HAS BEEN INSTALLED in a number of coaling and sanding plants recently completed at various points a sand drying stove which relies on a number of fin-like projections on the body of the stove for its effectiveness in removing the moisture from the sand. These projections, of which there are five, placed one above the other as integral parts of the stove, have convex surfaces and are open on the underside, thus permitting the heat from the fire to come in direct contact with the wet sand around the stone, as well as through the increased metal surface. When dry the sand escapes through outlet holes in the base. The illustration is a view of the stove without the sand hopper. This is simply a steel plate which rests upon the rim shown in the photograph and extends outward to a height of three feet, the diameter of the top being 49½ in. As this hopper is conical in shape, it not only contains the sand but keeps feeding it against the stove as it is dried.

Constructed in the manner described, the dryer is said to be capable, with a good grade of sand, of producing

The Perfection Dryer with the Hopper Removed to Show the Fins

12 tons of dry sand per 24 hours. In one installation it is said the dryer operated 24 hours a day for nine months and 13 days, at the end of which time the stove required only the renewal of the grate. The stove complete weighs 1,300 lb. and is known as the Perfection Cone Stove Sand Dryer, of which the Roberts & Schaefer Company, Chicago, is the distributor. At the present time, two of the stoves are in use on the Michigan Central at Michigan City, Ind., and one on the Chesapeake & Ohio at Peach Creek, Va.

As a result of numerous inquiries relative to the course pursued by different railway organizations in preparing A. F. E.'s and resulting completion reports, a meeting was called for those interested to discuss the subject informally, following the close of the regular afternoon session yesterday.

EDITORIAL

Railway Age

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Passenger Station Facilities

Much credit is due the Committee on Yards and Terminals, and especially one of its sub-committees, for the completeness of its report on passenger station facilities. This subject has always been a live one since it exerts not only an important bearing upon the costs of passenger train operation but likewise upon public relations and consequently upon possible increases in or decreases of, revenue business. The passenger station is one of the critical points of a railway and upon its design hinge factors of real importance to the railroads, not only for the present but in the future as well. It is a facility in which practically every feature must be adequately balanced against the unit as a whole, a result which is not easy to attain. Like most things, experience is the best guide and because of that and the constantly changing conditions, local and otherwise, it becomes extremely necessary that the survey of passenger facilities involved in the working out of a new design be as thorough and complete as possible. It is in this respect that the work of the committee merits special commendation for, in addition to bringing this subject up-to-date, it has covered in detail the design, location, arrangement, size and use of every major and most minor facilities upon which efficient station design and operation depend. It is a substantial work and a real addition to engineering literature.

Operating Reports of Signal Section

The reports which were presented at the annual convention of the Signal section, A. R. A., contained considerable material devoted to the solution of signal maintenance and train operation problems. It is important at this time that attention be given to those factors having to do with the economical operation of signaling equipment. Among these may be listed, rules for the direction of levermen at interlockers, instructions for testing signal relays, and detailed studies showing the benefits derived from signaling certain stretches of railroads. Glancing back through the proceedings of the association, it will be seen that similar subjects have been given attention from time to time. However, in the past five or six years specifications have received greater consideration. It is recognized that these must be kept up to date, but it is gratifying to see renewed activity along lines of study that will promote efficiency and economy in the maintenance of signal equipment and in the demonstration to the higher railroad officers of the way in which signaling will expedite train movements.

The Engineer and Water Treatment

There are a large number of engineers who have become firm believers in the merits of water treatment, and who have actively encouraged the railroads to engage extensively in this practice. There are others who for one reason or another are skeptical and if they concern themslves at all about it, confine their attention only to the construction and repair of what some one outside of the engineering department has succeeded in having installed.

The latter attitude is wrong and should be discarded for the better one. The reasons are plain and compelling. In the first place, every day finds water treatment establishing itself more securely in railway operation. Its value and importance can no longer be minimized or denied. The day when it could be looked upon with suspicion has passed. While its development may be hindered through ignorance, understanding or prejudice there is no longer the possibility of completely obstructing its progress on the roads. Specifically water treatment has demonstrated beyond question its ability to reduce engine failures. It has proven itself capable of effecting large reductions in the cost of locomotive repairs; of effecting definite economies in fuel consumption; of enabling railroads to operate engines over longer runs. So definitely has it proved its practicability that even the courts have taken it into consideration in litigation. While engineers do well, therefore, to exercise caution in their water heating studies, their relation toward it should not be characterized or influenced by skepticism.

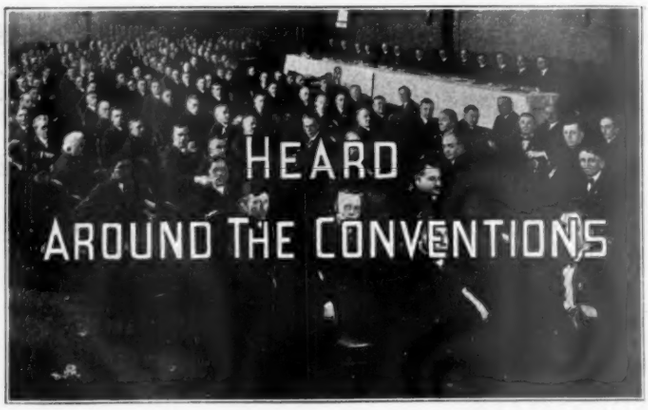
Again water treatment should receive the considera-

tion of the engineer because it is fundamentally engineering. In the first place it devolves upon the engineer to determine and pass upon the appropriations for such facilities. Again it devolves upon the engineer to build the facilities and further, to control the operation of the facilities, and finally it rests largely with the engineer to ascertain the results of water treatment.

It is in water service unlike any other field of activity, that the engineer can demonstrate his worth to the other departments. In anticipating actively in the work of water treating he becomes at once an operating and a mechanical man and by the application of his specialized training he can render a service to these departments, especially the mechanical department, that cannot but work to his advantage. It is not enough, therefore, for the engineer merely to build facilities. Conceding the merit in the practice, he should take definite steps to familarize himself with all its details and by all means avoid relinquishing his interest in the subject once the facilities for water treatment are built. And as to familiarizing himself with water treatment, let the engineer remember that the water service committee of his association has proved itself eminently able to help.

Support the Recommendations of the Association

ATTENTION WAS CALLED in the discussion in the Engineering Association convention yesterday to a bad practice on the railroads. This association meets regularly, and after careful consideration by its committees and full discussion, the convention adopts recommended standards of practice which are published in its manual. Individual railways then disregard many of these recommended standards. As was pointed out yesterday, either the standards recommended in the manual are the best practice, or they are not. If they are not the best practice, then the manual should be changed. If they are the best practice, they should be followed. The policy of adopting standards and then not living up to them has various dangers. When the American Railway Engineering Association makes a standard recommended practice, this gives a reasonable ground for argument that, according to the highest authority, that is the best standard regarding a particular matter. Suppose, now, an accident occurs on a railway and it can be shown that there is some relationship between the failure of that road to follow some practice recommended by the association and the cause of the accident. The introduction of the Manual would be evidence to any court or jury that the railway which had failed to adopt the standard recommended had not done all it reasonably could to prevent the accident. Again, public sentiment demands, and by plain implication the Transportation Act requires, that the railways shall be managed with the greatest practicable efficiency. The fact that the Engineering Association's Manual recommmends a certain practice as the best practice, and the further fact that a large number of the individual railways were not following that practice would be evidence of inefficiency which would be extremely difficult to refute. If a railway does not believe that a certain practice recommended in the Manual is the best practice, it can always endeavor to get the Manual changed, and if it does that and fails, then it can offer a good defense for departing subsequently from the practice recommended. No good defense can, however, be offered for railways which make no protest against continuance or adoption in the Manual of recommended practice which it constantly disregards.



The Seaboard Air Line was one of the roads most thoroughly represented at the convention with W. D. Faucette, chief engineer; E. A. Frink, principal assistant engineer; J. L. Kirby, engineer maintenance of way; D. Leard, right-of-way engineer; W. L. Darden, engineer of buildings, and seven division engineers in attendance.

* * *

The Norfolk & Western has recently placed in service a new transmission line preparatory to the extension of electric operation over a newly electrified stretch of track from near Kimball, W. Va., to Wilco. In addition to the new work, which is about 14 miles long and over which electric operation will start shortly, considerable other electrification has been completed in the yards and terminals in this vicinity.

* * *

D. C. Fenstermaker, formerly district engineer of the Chicago, Milwaukee & St. Paul, was recently appointed chief engineer in charge of location and construction of a line extending from Kasper, Wyo., to Miles City, Mont., which is being projected by local oil interests. This project is being conducted under two separate companies, organized under the laws of Montana and Wyoming respectively.

* * *

In accepting the report of the Committee on Wooden Bridges and Trestles yesterday, the convention took a noteworthy action, notwithstanding the fact that it was unmarked by any particular emphasis in the meeting. Repeatedly in the last 20 years this committee has presented standard designs for wooden trestles, only to have them rejected by the convention, but this year it was successful in its endeavor.

* * *

One noteworthy feature of yesterday morning's session was a brief recess introduced by President Campbell in order that he might present the Hon. H. B. Carvell, principal speaker at the dinner on Wednesday night. While expressing his lack of any engineering knowledge, Mr. Carvell's brief remarks indicated that he was not unfamiliar with engineering problems and of their similarity in some respects with those of his own profession —law.

* * *

At a meeting of the Service Bureau Board of the American Wood Preservers Association held in Chicago on Tuesday, the board was reorganized in conformity with the revised constitution of the A. W. P. A. as amended at the New Orleans convention in January. E. J. Stocking, vice-president of the Central Creosoting Company, Chicago, resigned as treasurer and as a member of the board and was succeeded by George E. Rex, vice-president of the National Lumber & Creosoting Company, Kansas City, Mo.

On the Echo Canyon Line of the Union Pacific. Original Line on the Left. New Low Grade Line in the Center

A.R.E.A. Completes Most Successful Convention

Thursday's Sessions Included Reports of Seven Committees and the Installation of Officers

THE TWENTY-FOURTH ANNUAL CONVENTION of the American Railway Engineering Association came to a close shortly after 4 o'clock yesterday afternoon, bringing to an end the most successful meeting in the history of the association. While the total registration was slightly under the record established last year, the interest in the reports was greater than at any previous meeting and the attendance in the convention room was larger than usual. A feature of the closing business was the passage of a resolution by the association placing it on record in favor of the inauguration of a movement by the railways for the celebration of the centennial of American railway development.

Reports were presented by the committees on: Uniform General Contract Forms, Electricity, Buildings, Wooden Bridges and Trestles, Records and Accounts, Yards and Terminals and Wood Preservation following which the officers were installed.

Report on Uniform General Contract Forms

No committee performs work of greater value than the Committee on Uniform General Contract Forms. But the subject matter of its reports is necessarily so entirely devoid of what is popularly called "human interest" that the committee's appearance before the convention is rarely fruitful of animated or protracted discussion. The committee has important work in hand in its participation in the Joint Conference on Uniform General Contract Forms, a project initiated by the Association of General Contractors. The committee's statement with respect to this work indicates that the prime question involved relates to the arbitration clause. The matter submitted to the association in the committee's report included a revision of the form of lease agreement for industrial sites; a revision of the form of industry track agreement; a tentative form of agreement for trackage rights; a form of license for private road crossings and a tentative form of agreement for the purchase of electricity. The tentative forms mentioned above were submitted as information, the others for approval and publication in the Manual. W. D. Faucette has been chairman of the Committee on Uniform General Contract Forms for the past three years and has also served as a member on this committee for seven years.

W. D. Faucette
Chairman

THE COMMITTEE RECOMMENDED changes in the Manual as set forth in Appendix A be adopted. These changes embrace (a) revised form for Lease Agreement for Industrial Site, and (b) Industry Track Agreement. It also recommended the adoption of the "Form of License for Private Road Crossings," as submitted in Appendix C. The committee also presented a tentative draft of "Form of Agreement for Trackage Rights" as information.

Committee: W. D. Faucette (S. A. L.), chairman; J. C. Irwin (B. & A.), vice-chairman; C. F. Allen (Cons. Engr.), F. D. Anthony (D. & H.), Wm. G. Atwood (Nat. Research Council), W. H. Brameld (Erie), J. B. Carothers (B. & O.), C. Dillenbeck (P. & R.), W. A. Duff (C. N. R.), E. M. Durham, Jr. (U. S. R. A.), F. H. Fechtig (A. C. L.), B. Herman

(Sou.), O. K. Morgan (C. C. & O.), F. L. Nicholson (N. S.), C. B. Niehaus (C. of Ga.), H. A. Palmer (C. N. R.), A. C. Shields (C. R. I. & P.), E. L. Taylor (N. Y. N. H. & H.), C. A. Wilson (Cons. Engr.).

Appendix A

Form of Lease Agreement for Industrial Site

Parties.—1. THIS LEASE, made this.....day of ....., 19...., between the ....., a corporation, the Lessor, hereinafter called the Railway Company, and ....., having a principal office or place of business in the ....., County of ....., and State of ....., hereinafter called the Lessee,

WITNESSETH: That the Railway Company, in consideration of the rents to be paid and agreements to be performed by the Lessee, hereby leases unto the Lessee all those certain premises, situated in the ....., County of ....., State of....., described as follows:

Description.—2. in accordance with plan numbered ..... dated ....., designated as ..... hereto attached and made a part hereof.

Purpose.—3. The said premises shall be used for ....

Term.—4. To have and to hold the same from ...., 19....., to ....., 19....., unless sooner terminated, as hereinafter provided.

Termination.—5. Either party hereto may terminate this lease at any time, by giving to the other party ..... days' written notice to that effect. Acceptance of rent in advance by the Railway Company shall not act as a waiver of the right to terminate this lease.

Notice.—6. Any written notice given by the Railway Company to the Lessee shall be deemed to be properly served if the same be delivered to the Lessee, or one of Lessee's agents, or if posted on said premises, or if mailed, postpaid, addressed to the Lessee at Lessee's last known place of business.

Rent.—7. The Lessee shall pay to the Railway Company a rental of ..... per ..... payable ..... in advance, beginning, 19.....

Refund.—8. Rent paid in advance for a period extending beyond the termination of this lease shall be refunded to the Lessee, unless such termination shall be on account of violation or non-fulfillment of any of the terms of this lease by the Lessee, or on account of abandonment of said premises by the Lessee, in which case the amount paid as rental shall be retained by the Railway Company.

Taxes.—9. The Lessee shall pay all taxes, licenses and other charges which may be assessed or levied upon said premises, including improvements thereon, and upon the business of the Lessee upon said premises, or against the Railway Company by reason of occupation or use of said premises by the Lessee.

Assignment.—10. This lease shall not be assigned or in any manner transferred nor said premises or any part thereof sublet, used or occupied by any party other than the Lessee, nor for any purpose other than that specified herein, without the written consent of the Railway Company.

Abandonment.—11. The failure of the Lessee to occupy or use said premises for the purpose herein mentioned for .... days at any one time shall be deemed an abandonment thereof. An abandonment of said premises by the Lessee shall, at the option of the Lessor, operate as an absolute and immediate termination of this lease without notice.

Improvement.—12. The Railway Company hereby gives to the Lessee the privilege of erecting, maintaining and using on said premises, suitable buildings and other structures for the aforesaid purposes; provided that such buildings and other structures shall be approved by the ..... of the Railway Company, and thereafter maintained and painted to the satisfaction of the Railway Company.

Clearance.—13. The Lessee agrees not to permit any obstruction over any railway track or tracks on said premises, less than ..... feet above top of rail, or alongside of said track or tracks less than ..... feet from center of track, with the necessary additional clearance on curves.

Removal of Improvements.—14. Upon the termination of this lease in any manner, the Lessee shall deliver to the Railway Company the possession of said premises, remove all the improvements placed thereon by the Lessee, and restore said premises to substantially their former state. Should the Lessee fail, within ..... days after the date of termination of this lease, to make such removal or restoration, then the Railway Company may, at its election, either remove said improvements and restore said premises to substantially their former state at the sole cost of the Lessee, or may take and hold the said improvements as its sole property.

Inflammables.—15. No goods of an explosive, dangerous or inflammable nature shall, in any case, be stored in or upon said premises without the written consent of the Railway Company.

Condition of Premises.—16. The Lessee shall at all times keep said premises in a safe, clean and sanitary condition, and shall not mutilate, damage, misuse, alter or permit waste therein.

Right of Inspection.—17. The said premises shall be open at all reasonable times for inspection by the Railway Company, its agents, and authorized applicants for purchase or lease.

Advertising.—18. No advertising shall be placed on said premises without the written permission and approval of the ..... of the Railway Company.

Laws and Regulations.—19. The Lessee shall, without cost to the Railway Company, comply with all laws, rules, regulations and ordinances affecting said premises.

Miscellaneous Charges.—20. The Lessee shall pay all charges for water, lighting, street sprinkling, sweeping and oiling, and may be levied or assessed against said premises, during the period of occupancy.

Snow and Ice.—21. The Lessee shall at all times keep the sidewalks abutting said premises free from snow and ice, and any expense to the Railway Company by reason of the failure of the Lessee so to do shall be paid by the Lessee to the Railway Company upon demand therefor; such expense to include all loss of or damage to property and injury to or death of persons.

Use of Tracks.—22. The Lessee shall not allow any tracks to be constructed or operated upon said premises, without the written consent of the Railway Company.

Liability.—23. The Lessee agrees to indemnify the Railway Company and save it harmless from any and all claims and expenses that may arise or may be made for death, injury, loss or damage resulting to the Railway Company's employees or property, or to other persons or their property, by reason or in consequence of the occupancy or use of said premises by the Lessee.

Forfeiture.—24. Any breach of any covenant, stipulation or condition herein contained to be kept and performed by the Lessee, shall be sufficient cause for the immediate termination of this lease.

Insolvency or Bankruptcy.—25. If the Lessee at any time during the continuance of this agreement should become insolvent or bankrupt, or if Lessee's affairs should be placed in the hands of a Receiver, then this lease shall, at the option of the Railway Company, terminate, and the Railway Company shall have the right to resume and retake possession of said premises without any accountability whatsoever to the Lessee or to Lessee's estate.

Renewal.—26. A lawful continuance of the tenancy beyond said term shall be deemed a renewal thereof for the further term of ..... to end at the expiration thereof, without further notice; and every further lawful continuance shall be deemed a further renewal for a like term, to end in like manner, and every renewal or holding over shall be subject to the provisions of this lease.

Until terminated as hereinbefore provided, this lease shall inure to the benefit of and be binding upon the parties hereto, their heirs, executors, administrators, successors and assigns.

IN WITNESS WHEREOF, the parties hereto have executed this lease on the day and year first above written.

WITNESSES:

.....

.....

.....

.....

Railway Company.

By .....

.....

.....

Lessee.

By .....

Form of Industry Track Agreement

THIS AGREEMENT, made this ..... day of ....., 19...., between .....

.....

hereinafter called the Railway Company, and .....

.....

hereinafter called the Industry;

WITNESSETH,

WHEREAS, the Industry desires track facilities, hereinafter called sidetrack, for the economical and convenient conduct of the business of the Industry, at or near ..... Station, County of ....., State of ....., described as follows:

in accordance with plan numbered ....., dated ....., designated as .....

hereto attached and made a part hereof; and,

WHEREAS, the operation of cars and engines over said sidetrack at other than the regularly established station facilities of the Railway Company involves the risk of damage to or destruction of property and injury to or death of persons:

Now, therefore, in consideration of the covenants and agreements herein contained, it is mutually agreed that the said sidetrack shall be constructed and maintained, and the Railway Company hereby agrees to operate the same under the following terms and conditions:

Right-of-Way.—1. The Industry shall provide, without cost to the Railway Company, all necessary right-of-way outside of the right-of-way of the Railway Company, required for the proper construction and operation of said sidetrack, said right-of-way to be satisfactory to the ..... of the Railway Company.

The cost and expense of procuring or complying with any ordinance, order, permit or consent whatsoever required by Municipal, State, or other lawfully constituted authorities for the construction, operation, maintenance and use of said sidetrack shall be borne by the Industry.

The Railway Company shall have the right to enter upon the property of the Industry, for the purpose of constructing, maintaining and operating said sidetrack.

Construction.—2. The cost of constructing said sidetrack, including roadbed, trestles, bridges and all other appurtenances in connection therewith, shall be borne as follows:

Maintenance.—3. Said sidetrack shall be maintained (including removal of ice and snow) and renewed to the satisfaction of the ..... of the Railway Company; the work shall be performed and the cost thereof borne as follows:

Ownership.—4. The title and ownership of said sidetrack shall be vested as follows:

Use.—5. The Railway Company shall have the right to use, without cost, the whole or any part of said sidetrack for general railway purposes, provided such use shall not unreasonably interfere with the use thereof by the Industry.

The Industry shall not permit or authorize the use of said sidetrack by or for the benefit of any other person, firm or corporation not one of the parties hereto, nor assign this contract or any rights thereunder, without the written consent of the Railway Company.

Changes or Enlargement.—6. If any change, rearrangement, extension or enlargement of said sidetrack or its structures shall at any time be required by reason of any change in the Railway Company's track or tracks, or because of any changes in the operating practice of the Railway, or for any other cause, the Railway Company shall not be required to bear any expense resulting therefrom.

Clearances.—7. The Industry agrees not to permit any obstruction over said sidetrack, less than ..... feet above top of rail, or alongside of said sidetrack less than ..... feet from center of track, with the necessary additional clearance on curves.

Liability.—8. The Industry agrees to indemnify the Railway Company and save it harmless from any and all claims and expenses that may arise or be made for death, injury, loss or damage, resulting to the employees or property of the Railway Company or to the employees or property of the Industry, or to any other person or property upon the premises of the Industry by request or consent of the Industry, whether by fire or otherwise (except where it can be shown that such death or injury to persons or loss of or damage to property was due solely to negligence on the part of employees of the Railway Company), arising out of the construction, maintenance, use or operation of said sidetrack for account of said Industry.

Discontinuance.—9. Any and all loss or damage sustained in consequence of any temporary or permanent elimination of said sidetrack, shall be assumed by the Industry, or in event the disposition of the property of the Railway Company or its future use or development shall make it impracticable in the judgment of the ..... of the Railway Company to continue the connection, the Industry hereby waives any and all claims therefor.

Cancellation, Termination and Removal.—10. This agreement shall be terminable upon ..... (.....) days' written notice from either party to the other.

Upon termination of this agreement the Railway Company shall have the right to enter upon the property of the Industry and remove any or all of the material owned by the Railway Company, and shall not be liable to account in any way to anyone for any monies paid or expended on account of any of the track or tracks covered by this agreement, nor for any damages resulting from the removal of any or all of the material owned by the Railway Company.

Until terminated as hereinbefore provided, this agreement shall inure to the benefit of and be binding upon the parties hereto, their heirs, executors administrators, successors and assigns.

IN WITNESS WHEREOF, the parties hereto have executed this agreement in ..... in day and year first above written.

Witness for Railway Company:

....
Railway Company.

By .....

Witness for Industry:

....
Industry.

By .....

Appendix C—Form of License for Private Road Crossing

The ....., hereinafter called the Railway Company, hereby gives to ....., hereinafter called the Licensee, the license and privilege of constructing, an overhead / maintaining and using a grade crossing over the lands and right- an undergrade / of-way and over, under or across the tracks of the Railway Company situated in ..... and substantially as shown on the plan hereto attached, designated as ..... and dated ..... and made a part hereof:

1. The term of this License shall date from ....., 19...., and shall continue until terminated by a written notice given by either party to the other at least ..... days prior to the date of termination.

2. The Licensee shall pay to the Railway Company as consideration for said license and privilege the sum of .... on the ..... day of every ..... during the continuance of this license, and pro rata for a shorter period; a proportionate part of said consideration to be refunded to the Licensee in case of termination hereof by the Railway Company prior to the date to which the consideration shall have been paid.

3. The Licensee shall, at its own expense, construct and maintain said crossing in compliance with all statutory regulations and to the satisfaction of the Railway Company, and under the Railway Company's supervision and direction, and, except in case of emergency, shall do no work with reference to the maintenance of said crossing except under such supervision and direction, and after reasonable notice in writing to the Railway Company. The Railway Company may at its option construct and maintain such crossing and, in such event, the Licensee shall pay to the Railway Company the entire cost and expense of all labor performed and materials furnished by the Railway Company in constructing and maintaining said crossing.

4. The Licensee shall provide and maintain such protection by signs or otherwise, as the Railway Company may consider necessary.

5. The Licensee shall permit said crossing to be used only by the Licensee's agents and servants and by persons having business with the Licensee.

6. The Licensee shall not obstruct or interfere with the passage of the Railway Company's trains. The Licensee shall indemnify and save harmless the Railway Company against all claims or payments on account of loss, damage or expense to the property either of the Licensee, or the Railway Company, or others, or to the persons of the Licensee, the Railway Company's agents and servants, or others, which may be due directly or indirectly to said crossing, even if such loss, damage or expense may be due to contributary negligence by the Railway Company.

7. The Licensee shall, on request of the Railway Company, remove said crossing from the premises of the Railway Company or make such changes in said crossing as may be required by the Railway Company, if such removal or changes shall in the judgment of the Railway Company be needed in connection with the development or use of the premises of the Railway Company. The Railway Company may, at its option, do such work and in such event, the Licensee shall pay to the Railway Company the entire cost and expense of all labor performed and materials furnished by the Railway Company in connection with such work.

IN WITNESS WHEREOF, the parties hereto have executed their agreement to this License this ..... day of ....., 19.....

Railway Company.
By .....

Witness:

.....
(Licensee)

Witness:

Discussion

(In taking up the discussion of the report, Chairman Faucette referred to the developments which have taken

place in the joint National Contract Conference at Washington, mentioning in particular the general sentiment in favor of supplanting the chief engineer's prerogatives as the sole arbiter and emphasizing the necessity for an expression of a definite policy as to this matter by the association.)

(C. Dillenbeck (P. & R.) then outlined the sub-committee's report on Revisions of the Manual and a *motion to adopt the revisions for inclusion in the Manual was carried.* Mr. Dillenbeck then outlined the report of the sub-committee on The Form of Industry Track Agreement and a *motion to adopt the form of agreement recommended carried.*)

Mr. Faucette took up the report on A Form of License for Private Road Crossings and offered a motion to adopt the report as approved practice.

G. A. Mountain (Can. Ry. Commission): We have never been able to find but two crossings that are legal with us, a farm crossing and a highway crossing, but there are cases where I think private crossings would be very advantageous to all parties. I would like to find out how this matter is being handled in the United States.

Mr. Faucette: The committee realizes the difficulty. We thought if an agreement of this kind could be workable we would present the agreement. A great many of the states make it almost impossible to pry loose a public crossing once it is established, but if we can do anything to diminish the number of grade crossings in this country we should put that lever in, and we want to go on record that we are trying to protect the traffic and the man himself.

(Mr. Faucette's motion was carried. The committee was excused with the thanks of the association.)

Report of Committee on Wood Preservation

The report on wood preservation is one of the most extensive presented this year. Three of the subjects dealt with the protection of piling in waters infested by marine borers. In Appendix D, devoted to piling studies along the Atlantic and Gulf coasts, the committee recommended that timber and piles be creosoted carefully, supplemented by attention to their selection and preparation prior to treatment and to subsequent handling. Appendices E and F described the placement along the United States coast line jointly with Federal aid of test boards for observation. The reports were copiously illustrated with views of marine borer action, including that to which concrete is subject. The committee also reported on Douglas fir treatment, devoting Appendix C to the subject. It concluded that Douglas fir is satisfactory if properly treated and handled and explained how this could be done. The prevailing practice as to the use and treatment of white oak ties in Appendix G was discussed. An extended report was made on the subject of preparing timber for treatment. Considerable attention was also given to the adzing and boring of ties, and the proper methods are described.

C. M. Taylor, superintendent of timber preservation of the Central Railroad of New Jersey, was chairman for the fifth successive year.

C. M. Taylor
Chairman

In Appendix A the committee presented revisions to the Manual and in Appendix D specifications for creosoted piles and timbers for use in Atlantic Coast waters infested with marine borers; presented below. In Appendices G and H, discussions of the treatment of white oak ties and the mechanical preparation of ties and timbers were presented, the conclusions of which are given here. Service Tests Records, Douglas Fir Treatment, Pacific Coast Marine Piling Investigations, Marine Piling Research and an Indicator of Sodium Floride Penetration were presented in Appendices B, C, E, F and I. The committee recommended that the changes in the Manual shown in Appendix A be approved and substituted for the present recommendations in the Manual. It also recommended that the specifications for creosoted piles and timbers given in Appendix D be approved for publication in the Manual.

Committee: C. M. Taylor (C. of N. J.), chairman; S. D. Cooper (A. T. & S. F.), vice-chairman; Wm. G. Atwood (Nat'l Research Council), R. S. Belcher (A. T. & S. F.), H. C. Bell (N. & W.), E. H. Bowser (I. C.), Z. M. Briggs (Penna.), J. R. W. Davis (G. N.), C. F. Ford (C. R. I. & P.), Andrew Gibson (N. P.), C. E. Gosline (D. L. & W.), W. L. R. Haines (Penna.), R. H. Howard (Wabash), G. H. Hicks (N. P.), A. B. Ilsley (Engr.-Appraiser), W. H. Kirkbridge (S. P.), E. E. King (U. of Ill.), H. G. Laird (A. C. L.), J. B. McClain, J. F. Pinson (C. M. & St. P.), B. H. Prater (O. S. L.), H. N. Rodenbaugh (F. E. C.), H. Von Schrenk (Con. Engr.), O. C. Steinmayer (St. L.-S. F.), J. H. Waterman (C. B. & Q.), J. W. Williams (W. P.),

Appendix A—Revision of Manual

Piling for Land Construction

Present Form	Proposed Form
Treatment shall be in accordance with specifications for preservative treatment of wood with creosote oil (full cell process). The net amount of oil left in the piling shall be not less than 15 lb. per cu. ft. of wood.	Add to the present the following: Except in the case of Douglas fir, 10 lb. per cu. ft. shall be the minimum.

Appendix D—Marine Piling—Atlantic and Gulf Coasts

The committee recommended that timber and piles be carefully creosoted. There is no other treatment in sight at present. Along with the careful creosoting it appears that certain features of selecting and preparing the lumber and piles before treatment, and of handling after treatment, are of vital importance.

Timber and Treatment

All available information indicates that while the various borers may be a serious menace at several ports in the North Atlantic, they are most active in South Atlantic and Gulf ports. It seems probable that lighter treatments are probably as effective in northern waters as heavier ones in southern. This report, therefore, is chiefly of use to the railroads and industries having docks in southern waters and the recommendations and heavy

treatment specified herein are intended to apply only in this territory. Creosoting is the only treatment, and yellow pine is practically the only lumber used in this service.

In the warm, moist climate of the southeast, where most of this lumber is produced, it is generally not possible to air season large size sticks before they will start to decay. Therefore, notwithstanding the great importance attached by all authorities to the air seasoning of lumber before creosoting, practically all the piles used in this service are treated green as soon as possible after being cut. Even then it is necessary to cull very rigidly, to prevent doty pieces from being treated.

Under these conditions it is important that the treating be done only at the best equipped plants, having adequate power and efficient machinery, so that the required temperature, vacuum and pressure can be maintained without drop during the treatment.

In view of the foregoing, it will be appreciated that extreme care is needed in treating and handling creosoted piles and timbers if we are to render them immune from attack by marine borers. If a bit of the inner bark is left on the pile when treated, which afterwards is rubbed off, a lightly treated spot is left on the surface which will probably invite attack. If pitch pockets or resin streaks, which the creosote fails to penetrate, occur near the surface, a very small check may provide access to the untreated wood. The long steaming period at the maximum temperature called for by the specification is needed to melt out these pockets as far as practicable.

For the same reason water pockets and irregular penetration must be avoided, which means high-class equipment and skillful handling of the treating process. For the same reason also, piles should have a thick sap ring, in order that the surface may be protected by an armor of densely treated wood so thick that sun checks, or bruises from floating objects, will not extend through it.

Specifications for Creosoted Piles and Timber for Use in Atlantic Coast Waters Infested With Marine Borers

(I) Materials

(A) **Piles.** (1) Piles shall be unhewn Yellow Pine.

(2) For lengths not exceeding 30 ft., the minimum diameter at the tip shall be 9 in. For lengths over 30 ft., but not exceeding 50 ft., the minimum diameter at the tip shall be 8 in. For lengths exceeding 50 ft. the minimum diameter at the tip shall be 7 in. The minimum diameter one-quarter of the length from the butts shall be 12 in., and the maximum diameter at the butt shall be 20 in. (Same as A.R.E.A. "Railroad Heart Grade.")

(3) Piles shall be butt cut above the ground swell, have a uniform taper from butt to tip, shall be free from short bends, and so straight that a straight line from center of butt to center of tip shall lie within the body of the pile. When cut they shall be peeled and shall have the inner skin or bark completely removed. They shall not be allowed to lie on the ground, but if not moved at once to the treating plant they shall be placed on skids. All knots and scars shall be trimmed close to the body of the pile, so that when it enters the cylinder its surface shall be smooth.

(4) Piles shall be sound and free from the following defects: Large, loose, unsound or hollow knots; worm holes; knot holes; round shakes; red heart; or other defects which will impair their strength or durability. Turpentine faces not over 2 ft. in length will be allowed, provided they do not materially reduce the size.

(5) Piles shall have a sap ring of not less than 3 in. nor more than 5 in.

(6) Piles shall preferably be treated green; not later than two months after cutting. If partly seasoned piles are accepted for treatment, they shall receive same treatment as green piles.

(B) **Timbers.** (7) Timbers shall be Southern Yellow Pine. Pine.

(8) Except as noted, timbers shall be sawed to standard size, full length, square cornered and staight; close grained and free from defects, such as injurious wind shakes and cross grain, unsound or loose knots, knots in groups, decay, or other defects that will materially impair its strength.

(9) Timbers shall be sound, sap no objection. Wane may be allowed one-eight of the width of the piece measured across the face of the wane, and extending one-fourth the length of the piece on one corner, or its equivalent on two or more corners, provided that not more than 10 per cent of the pieces of any one size shall show such wane. (Same as "Standard." Interstate rules of 1905.)

(10) The bark and inner skin shall be completely removed from the wane.

(C) **Oil.** (11) Oil shall meet A.R.E.A. Standard Specifications for Creosote Oil. It shall be analyzed when received at the work in accordance with the recommended practice. See (20),)

(II) Treatment

(12) The treating plant and all equipment shall be maintained in first-class condition satisfactory to the Inspector throughout the treatment.

(13) Cylinders shall be supplied with air vents, steam coils; with recording gauges and thermometers, necessary to record the condition at all times.

(14) The owner of the plant shall provide and keep in condition for use at all times the apparatus and chemicals necessary for making the analyses and tests required by the specifications.

(15) Each charge shall include only piles of approximately equal sap wood content and equal seasoning.

(16) After placing in the cylinder, piles or timbers shall be steamed at least twenty hours. The temperature shall be gradually raised to 280 deg. F. (138 deg. C.) in three hours, held at this temperature for eight hours and gradually lowered to 250 deg. F. (121 deg. C.) at the end of the steaming period. The cylinder shall be frequently drained of condensation. The steam shall then be blown off. A vacuum of at least 24 in. shall be created in one-half hour and held at least 24 in. for a period of at least five hours. Oil shall be introduced without breaking vacuum until the cylinder is filled. Pressure shall be applied gradually, and maintained until sufficient oil has been injected to leave the required amount in the piles after releasing, or until in the judgment of the inspector the refusal point has been reached. The pressure shall not exceed at any time 200 lb. per squ in. The temperature of the oil during the pressure period shall not be less than 170 deg. F. (77 deg. C.) nor more than 200 deg. F. (93 deg. C.), and shall average at least 180 deg. F. (82 deg. C.),

(17) After treatment has been completed and the oil has been removed from the cylinder, the piles or timber shall be allowed to drain one-half hour.

(18) Unless the oil has been injected to refusal, at least 22 lb. per cu. ft. shall be retained in the piles.

(19) All measurements of oil shall be based on a temperature of 100 deg. (38 deg. C.) and correction shall be made for actual temperature by applying a proper reduction factor.

(20) Oil from each charge shall be analyzed for water content. No oil containing more than 3 per cent of water shall be used.

(21) Vacuum measurements specified herein are for treating plants located at the sea level. If plant is not located at sea level, proper correction for altitude shall be made.

(22) At least three piles in each tram shall be bored to test penetration of oil, and record shall be kept by inspector.

(23) Hole for testing shall be bored about 6 ft. from butt and plugged by a round creosoted plug, $\frac{1}{16}$ in. larger than the hole.

Recommendations for Handling and Installation

(1) Do not use cant hooks or dogs in handling. Use rope slings.

(2) Do not drop the piles when unloading so as to crack them or injure them.

(3) Frame and bore all timbers before treatment, whenever practicable.

(4) Whenever it is necessary to cut the piles, or timbers, or whenever they become scarred or abraded, carefully trim the abrasions and coat the cut surfaces with hot creaosote oil and cover with roofing pitch.

(5) Bore bolt holes $\frac{1}{16}$ in. smaller than the bolt and pour in hot creosote oil before driving bolts.

(6) Pour hot creosote oil into all unfilled holes and plug with treated plugs.

(7) Particularly avoid cutting or boring below high water mark.

(8) Drive piles as soon as possible after treatment. If necessary to store them cover with earth to prevent checking.

(9 These particular marine borers live and breed in wood exclusively. It is, therefore, probable that a great deal can be accomplished in checking their attacks by destroying their breeding places. It is recommended that all unused or untreated piles or timber be removed from the water in the vicinity.

(10) The purpose of the heavy treatment and care in handling recommended here is, first of all, to prevent the borers from gaining foothold, and, therefore, really applies only to that part of the pile between high water mark and the mud line.

Appendix G—Treatment of White Oak Ties

The committee recommended that all so-called "sap" ties of the species usually included under the term "white oaks" should be given a preservative treatment. It desired to emphasize at this time the necessity for doing this to obtain economy from their use.

The so-called "heart" ties of the species usually included under the term "white oaks" can be treated efficiently so that they should withstand decay in a manner similar to other treated ties, if proper precautions are taken. A decision to treat such ties should be made after a study of conditions at hand on each particular line in each particular locality has shown that economy can be effected thereby.

Appendix H—Mechanical Preparation of Timber for Treatment, Including Adzing and Boring of Ties

The committee did not feel that definite recommendations were required of it. It desires, however, to call attention to the following salient points:

(1) The framing of bridge timbers, and particularly of bridge ties and guard rails, before treatment, is practicable and economical.

(2) Practically all hewed ties and a large proportion of sawed ties require adzing and this may be done at less cost by machinery than by hand.

(3) Adzing of ties after treatment removes a portion of the most thoroughly impregnated wood, and reduces the resistance of the tie to decay.

(4) Spikes offer greater resistance to withdrawal when driven in bored holes of proper size than in the solid wood. The proper size of hole is a subject on which opinions differ, but for soft woods, 1/8 in. less and for hard woods 1/4 in. less than the diameter of cut spikes appears to be accepted as correct.

(5) The boring of holes before treatment greatly assists in the distribution of the preservative through the tie.

(6) Holes should be bored all the way through the ties. This opens additional cross-sections to the direct action of the preservative and prevents the accumulation of water in the hole.

Discussion

C. M. Taylor (chairman): The report of the sub-committee on Service Test Records will be presented by Dr. Hermann von Schrenk, (cons. timber engr.).

C. C. Cook (B. & O.): The committee suggests it make reports only on completed test records. I believe there is sufficient information in the hands of the railroads of this country with respects to tests that have been conducted over 10 to 20 years. That would make valuable information for reports to the conventions.

Chairman Taylor: If we attempted each year to give you the progress reports on this subject, it would result in a very voluminous and expensive report.

(The report on Douglas fir treatment was presented by R. S. Belcher (A. T. & S. F.) after which the next subject, specifications for the treatment of marine piling in Atlantic and Gulf Coast territory, was presented and accepted for publication in the Manual. The report on Pacific Coast Marine Piling Investigation was then outlined by W. H. Kirkbride (S. P.) and received as information. The work of the marine piling investigation of the National Research Council was then reviewed by Dr. von Schrenk and Col. W. G. Atwood, representing the council, following which Hunter McDonald (N. C. & St. L.) introduced a resolution addressed to the American Railway Association commending the work which the council is doing. This was approved by the association. The report on preservative treatment of white oak ties and that on the mechanical preparation of timber for treatment, including adzing and boring of ties were presented and received as information. The committee was then excused.)

Report of the Committee on Buildings

Although the committee endeavored to collect data concerning the design of one level freight houses, insufficient information was received in answer to questionnaires to warrant the preparation of a report. Better success, however, was secured relative to the design of multiple level freight houses and warehouses, enabling the committee to submit a final report on this subject, which was presented in Appendix A. It discussed the relation of land value to freight revenue, and building costs, the character of freight handled and its effect on the cost of handling. Studies were also made and full descriptions submitted of existing freight terminals built with a view to their use for warehousing purposes. Sectional views were included with this report. The committee also submitted full specifications for concrete and clay tile roofing, electric light wiring, hot air and hot blast heating, architectural terra cotta and architectural concrete stone, in Appendix B, which was submitted as information. The committee also submitted a system for numbering railway buildings with recommendations regarding its use.

W. T. Dorrance, designing engineer of the New York, New Haven & Hartford, was chairman for the third year and served his eighth year as a member of the committee.

W. T. Dorrance
Chairman

In Appendix A the committee presented a progress report on one level L. C. L. freight house design and a final report on multiple level freight and warehouse design too long to be included here. This appendix covered the subjects of design, relation of land value to freight revenue, relation of building cost to freight volume, required operating capacity, provision for future expansion, value of air right development, character of freight handled and its effect upon the cost of handling, etc. The preparation of specifications for buildings for railway purposes was continued along lines similar to those followed last year and the year before, seven additional specifications covering Concrete Roofing Tile, Clay Tile Roofing, Electric Light Wiring, Hot Air Heating, Hot Blast Heating, Architectural Terra Cotta and Concrete Architectural Stone, were presented for discussion

in an Appendix B, covering 22 pages. A system for numbering railway buildings was presented as information in Appendix C.

Committee: W. T. Dorrance (N. Y. N. H. & H.), chairman; J. W. Orrock (C. P. R.), vice-chairman; P. S. Baker (P. & R.), G. A. Belden (C. of Ga.), Eli Christiansen (C. R. I. & P.), Arthur Crable (H. V.), W. L. Darden (S. A. L.), F. M. Davison (N. Y. C.), Hugo Filippi (I. C.), J. B. Gaut (G. T.), A. C. Irwin (Portland Cement Assc.), F. R. Judd (I. C.), G. A. Mitchell (G. T.), L. G. Morphy (Rutland), R. V. Reamer (C. of N. J.), F. L. Riley (B. & O.), G. A. Rodman (N. Y. N. H. & H.), A. L. Sparks (M. K. & T.).

Appendix C—System for Numbering Railway Buildings

1. Preface.—For the purpose of identification in connection with Valuation Work, Fire Insurance, Building Records and Filing of Records and Correspondence, some method is desirable which will avoid confusion and accurately identify the structure in the field with the record in the office, and a system of numbering seems to best meet these requirements.

2. Building Schedule.—The adoption of any numbering system necessitates first preparing a schedule of buildings grouped in geographical order and giving dimensions and data as to type. It is also desirable to include on this same record the date of construction, cost, etc.

3. Type of System to Be Adopted.—The adoption of any system must depend on several factors.

(1) Purpose—
Valuation record.
Insurance record.
Maintenance record.
Present record filling system.

(2) Location and Character of Lines—
1. One long main line and few buildings.
2. A network of branch lines in congested territory with many buildings.
3. A terminal company having no long main line.

Any system should be based on permanent lines, so far as possible, and not in any way dependent on operating divisions, which are subject to changes.

4. Definition of Word Building.—For the purpose of this article the word building is deemed to include any structure coming within the various building accounts of the I. C. C. Classification of Investment Accounts and to cover:

Stations and freight houses.
Platforms and cover sheds.
Derricks and cranes.
Coal pockets, ash pits and sand towers.
Track or wagon scales.
Water tanks.
Signal towers and cabins.
Turntables and transfer tables.
Crossing and switch houses.
Drawbridge houses.
Car bodies removed from trucks and placed on foundations.
Tenement houses used by railway employes.
Shops, engine houses and similar buildings.
Power houses and sub-stations.

Small items may be omitted from the numbering scheme, such as:

Hose houses and boxes.
Stand-pipes.
Signal boxes and relays, batteries, etc.
Telephone boxes on post.
Small coal boxes.
Temporary construction shanties.
Small toilets and sheds.
Platforms.

5. Non-Carrier or Real Estate Buildings.—These are often located at some distance from right-of-way. Oftentimes on city streets, and it might be desirable to cover these by a separate series of numbers, or by attaching a prefix R. E. to the number, with the addition in small letters of the initials of the owning company.

6. Buildings on Railway Property but Owned by Outside Parties, either under Lease or as Encroachment.—These structures are oftentimes of importance and a record should be kept showing the character of the occupancy of railway land, but it would hardly seem proper to assign a building number, though we believe they should be shown on building schedule as a matter of information.

Buildings owned jointly by two or more roads, each road should show the building on its schedule and assign a number.

7. Suggested Systems of Numbering to Meet Conditions on the Various Roads.—1. Consecutive number only: On a road having comparatively few structures, the simplest system is to assign consecutive numbers to each structure from one end of the line to the other. This is not entirely satisfactory as it is not flexible, making no provision for new structures, except to add them to the end of the list and in a few years the list would be out of geographical order.

2. Combination of Letters and Figures: Under this system a letter is assigned to each branch of the road, a number to each station, and a separate number to each building at the station. This has some objectionable features, particularly at junctions, where it is difficult to determine to which branch a building belongs.

3. Mileage System: This consists of numbering each building with the nearest mile from the end of line, using decimals to indicate the exact location. At first thought this would seem to be the best system for the reason that it immediately gives an idea of location. The system is very satisfactory for a road consisting of one long main line and very few branches, and where the buildings are generally scattered. On a system made up of many small roads, with frequent junction points and frequent large groups of structures, the mileage system is not satisfactory account of confusion at junctions and duplication of numbers on parallel branches; also at shops and yards where several buildings would come on the same decimal of a mile.

There are several minor variations of the mileage system, such as:

(1) Using decimal of the mile for different structures. This necessitates an accurate survey to locate each building.

(2) Using consecutive numbers for the individual building in each mile section.

4. Valuation Section and Consecutive Numbers: Use the main valuation section number and assign consecutive number to each structure in the section. This has the same disadvantage as mileage system in that valuation section generally denotes ownership, and in terminals and yards there are often times several ownerships, at times overlapping, so that a building might be on two or three valuation sections.

5. Station, Name or Number and Consecutive Numbers: Assign an arbitrary number to each station group or large yard group, then assign consecutive number to each of the structures, starting from one end of the yard.

Note A—On branch lines where there are few buildings, one station number might be extended to cover a whole branch.

While the number in this system does not give any idea as to location, it does successfully overcome the complication at junctions and terminals, due to separate ownership or separate lines, and we believe is the best system for a railway built up of many short lines with frequent junction and yards.

6. Valuation Sections and Decimal Numbers: Most of the roads have now completed the valuation work and have a complete set of valuation maps, and all valuation records, real estate and general maintenance records are tied up to the valuation sections. These section numbers are becoming familiar and are being used by nearly all departments, so that it might be desirable to incorporate the valuation section number with the building number. On most roads the section number denotes ownership and in complicated yards and junctions it might be very desirable to have the ownership defined and marked on the buildings.

By using the valuation section number as the first part, or numerator of a fraction and the building number for the denominator, would seem to be very satisfactory. The building number to be any one of the various systems outlined above, or mile plan number with the decimal of the arbitrary station number, using the decimal or any other system which would best suit the needs of the individual carrier.

8. Styles and Kind of Numbers.—The several kinds under consideration are:

(1) Figures put on with paint and stencil.
(2) Enamel or other type of metal number plates.
(3) Stamped into the structure with steel dies.

Note—It is desirable that the number applied to the building should also show the initials of the owning company. This is particularly desirable on real estate buildings and structures at junctions with other railways.

1. The first method while cheap, as to first cost, is not durable and may be easily destroyed in re-painting of structure.

2. The second method necessitates having special metal plates made up and applied to the buildings; this is rather expensive and plates are readily removed or damaged by boys or lost by rusting of the fastenings.

3. The third method, based on stamping the number into the woodwork of the building, is cheap as to first cost. The numbers cannot be obliterated without considerable trouble, and if stamped into some portion which is seldom renewed should last as long as the building. It is suggested stamping the number over the main doorway, or, if this is not feasible, in the

wood frame of door at a uniform height of about 5 ft. or in the corner board on track side.

9. Size of Figures.—It is suggested that the figures be not less than 1 in. high and not more than 1½ in. high.

10. Application of the Numbers.—After adopting any system of numbering, and preparing the schedule, the numbers should be assigned and entered on the schedule, and applied to the structure.

Every item on the building schedule should be assigned a number, even though it is not considered feasible, or necessary, to apply the number in the field.

11. Keeping the System Up to Date.—Some one official should have the custody of original schedule, and it should be kept up to date by the assignment of numbers to each new building, as soon as authorized, and the number applied as soon as completed. When a building is destroyed or torn down, the record should be corrected immediately.

When a building is moved from one location to another the record should be corrected, and if moved into another section a new number should be assigned to comply with the numbering system in use.

Discussion

(The report was presented by W. T. Dorrance, chairman, with the aid of the sub-committee chairmen. As the committee had no matter to report for inclusion in the Manual, its report was accepted as information and the committee was excused.)

Report on Yards and Terminals

The committee presented a very detailed and thorough study of the proper relation which should exist between passenger station facilities and the business handled. This report which comprised an elaborate survey of 42 existing structures of all sizes and types of arrangement, gave in detail the design of the buildings and trackage, the amount of traffic handled, the capacities, length and ratios of tracks, the areas of platforms, waiting rooms, baggage rooms, etc., with a discussion of the important features of passenger station design and operation. From this data recommended values for all the various facilities were worked out and presented in the form of graphs, showing the relations which should exist. A set of specifications for the manufacture and installation of motor truck, buit-in, self-contained and portable scales were also presented. The sizes and capacities of the scales selected and recommended formed a marked reduction in the number of types now in use and should effect considerable economies in the future. The committee also presented some interesting data on the handling of freight in two-track-level freight houses, etc. A. Montzheimer, chief engineer Elgin, Joliet & Eastern, is completing his second year as chairman, having been vice-chairman for three years and a member for 19 years.

A. Montzheimer
Chairman

In Appendix A the committee presented a report on and specifications for the manufacture and installation of motor truck, built-in, self-contained and portable scales for railroad service, the specifications covering 20 pages.

In Appendix B, a progress report was presented on the handling of freight in two-track-level freight houses and team tracks, multiple story freight houses and by mechanical means, including the relative advantages and disadvantages of the use of freight houses as warehouses, in connection with L. C. L. freight houses. In Appendix C, the committee presented a detailed study of the proper relation of passenger station facilities which should exist between business handled and the size and arrangement of such facilities. This report is made up of detailed data dealing with a wide variety of large passenger stations on a great many railroads. The data cover factors of design, actual traffic in and out of existing stations, plans of yards, capacity figures, lengths and ratios of tracks, platforms, baggage facilities, sequence of location of facilities, etc.

The committee recommended that the following action be taken in regard to its report:

1. That the report in Appendix A, relating to motor truck, built-in, self-contained and portable scales for railroad service be approved for publication in the Manual.
2. That the report in Appendix B be received as a progress report.
3. That the following relations between factors of design in warehouse construction be published in the Manual as indicative of the proper relation which should exist in warehouses where the turnover of goods is moderately rapid:

(a) One elevator should be provided for each 40,000 sq. ft. of warehouse space served.

(b) The shipping platform area should be 4 per cent of warehouse storage floor area.

(c) There should be one car length of track siding for each 17,600 sq. ft. of warehouse storage area.

(d) There should be one foot of tailboard frontage for every 1,100 sq. ft. of warehouse storage area.

(e) There should be 16 ft. of tailboard frontage for each car length of siding.

4. That the definitions of "Stub Station," "Through Station" and "Loop Station," shown in Appendix C, be approved for publication in the Manual.
5. That the conclusions in Appendix C be approved for publication in the Manual.

Committee: A. Montzheimer (E. J. & E.), chairman; Hadley Baldwin (C. C. C. & St. L.), vice-chairman; F. J. Ackerman (K. C. T.), J. R. W. Ambrose (Toronto Term.), Irving Anderson (A. T. & S. F.), W. R. Armstrong (O. S. L.), J. E. Armstrong (C. P. R.), F. C. Baluss (D. M. & N.), C. A. Briggs, A. E. Clift (I. C.), L. G. Curtis (B. & O.), J. D'Esposito (Chicago Union Station), H. T. Douglas, Jr. (C. & A.), A. W. Epright, E. M. Hastings (R. F. & P.), Reuben Hayes (Sou.), L. J. F. Hughes (C. R. I. & P.), J. B. Hunley (C. C. C. & St. L.), D. B. Johnston (Penna.), B. H. Mann (M. P.), R. O. Maxey, J. H. Milburn (B. & Q.), F. E. Morrow (C. & W. I.), C. H. Mottier (I. C.), C. L. Persons (C. B. & Q.), H. J. Pfeifer (Term. R. R. of St. Louis), H. L. Ripley (N. Y. N. H. & H.), C. E. Smith (Cons. Engr.), E. E. R. Tratman (Engr. News-Record), J. G. Wishart (C. R. I. & P.).

Appendix A—Passenger Station, Freight House and Grain Weighing Scales

The committee found, by inquiry through a questionnaire addressed to all roads, that there was practically no uniformity among the railways as to the sizes of platforms and the capacities of scales used in railway service. A digest of replies to the questionnaire, not including a number of roads that replied late, showed a surprising variety in the characteristics of scales as reported in use, as follows:

(a) **Freight House Scales** (not including portable scales). Total number of sizes of platforms in use, 81; total number of

railroads reported, 70: sizes of platforms ranging from 2 ft. 3 in. by 3 ft. 6 in. to 11 ft. by 14 ft.

(b) **Passenger Station Scales.**—Total number of sizes of platforms in use, 52; total number of railroads reported, 56; sizes of platforms ranging from 1 ft. 5 in. by 2 ft. 1 in. to 9 ft. by 10 ft. and duplicating numerous sizes included in (a).

(c) **Portable Scales.**—Total number of sizes of platforms in use, 65; total number of railroads reported, 70; sizes of platforms ranging from 12 in. by 15 in. to 102 in. by 120 in.

A tabulation of the recommendations of the roads reporting (not including those reporting late) as to sizes of platforms and capacities favored for adoption as standards aggregate an unreasonable number of sizes and capacities which, of course, was not unexpected for obvious reasons. The figures follow:

(d) **Freight House Scales.**—Number of sizes of platforms recommended, 34; ranging from 3 ft. 6 in. by 3 ft. 6 in. to 11 ft. by 14 ft. Number of capacities recommended, 12; ranging from 2,000 to 24,000 lb. The different combinations of sizes and capacity recommended aggregate 67 different types of scales.

(e) **Passenger Station Scales.**—Number of sizes of platforms recommended, 33; ranging in size from 1 ft. 5 in. by 2 ft. 2 in. to 9 ft. by 10 ft., the sizes recommended duplicating numerous sizes included in (d). Number of capacities recommended, 16; ranging from 500 lb. to 20,000 lb., the capacities recommended duplicating for the most part sizes included in (d), but adding a number of types of scales not included in the 67 types mentioned in (d).

(f) **Portable Scales.**—Number of sizes of platforms recommended, 46; ranging from 12 in. by 15 in. to 102 by 120 in. Number of capacities recommended, 17; ranging from 150 lb. to 10,000 lb. The different combinations of size and capacity aggregate 55 different types of scales.

It would be manifestly absurb to standardize so many sizes and capacities and so many extra combinations of size and capacity. The committee, therefore, selected what it considered the necessary types to meet the general demand and listed the same in its draft of specifications quoted below, as follows:

Built-In Scales. 5 tons, 6 ft. by 5 ft., 8 ft. by 6 ft. and 9 ft. by 7 ft.; 10 tons, 8 ft. by 6 ft. and 9 ft. by 7 ft.

Self-Contained Scales. 2,500 lb., 46 in. by 38 in.; 4,000 lb., 48 in. by 48 in.; 10,000 lb., 72 in. by 54 in.

Portable Scales. 1,000 lb., 18 in. by 27 in.; 2,000 lb., 25 in. by 32 in.

Excepting possibly in a few instances railway companies do not at present buy such scales on specification, but, as formerly was the case also with track scales, simply give the manufacturer sizes and beam capacities desired and take in good faith what is furnished by the manufacturer from his line of goods, which will be scales that in his judgment will fulfill the requirements. It has been left almost solely to the manufacturer to determine the scale design and the strength of parts, and to fix the capacity rating of the scales. The manufacturers as between themselves are competitive and have no common standard of design or capacity rating. This makes a situation in which the purchaser is relatively uninformed as to what he gets and the chaotic situation reflected by the questionnaire is the natural consequence.

It has been customary for the manufacturer of portable and depot scales to assume an arbitrary percentage of the beam capacity or load factor as applied on one corner, or end of the scale, and their scales have been so designed. This assumed load factor was low and it is well known that in many instances a large percentage of the load weighed, which may equal the beam capacity, comes on one corner.

With this low load factor, however, the manufacturers have used comparatively low unit stresses and it was felt that a more consistent design would result if a larger load factor were specified, combined with somewhat higher fiber stresses.

It seemed that for small castings which occur in such scales, that the fiber stresses used in the design of track scales might safely be increased to determine such permissible stresses; all available tests of cast iron in transverse bending were studied and arrangements were made to test actual scale levers and specimens of various sizes and shapes, and the table of stresses submitted is based on this study.

The stresses for cast iron take into account the well-established fact that the strength of cast iron increases as the section of the member decreases. The maximum stresses tabulated apply to very small or light scales; the sections of the parts of larger scales, such as motor truck scales, would be of such dimensions that the lower stresses approaching that allowed for track scales would be used.

Scales designed under these specifications will be consistent throughout and will safely provide for actual and probable condition of loadings, and at the same time will not seriously affect present manufacturing methods or designs.

While the committee was not expressly directed to consider the subject of motor truck scales, it became apparent that the now heavy current use of motor trucks made such consideration highly pertinent, particularly as specifications for motor truck scales have so many provisions in common with the various types of depot scales. The committee, therefore, so drafted its specifications as to include the essential provisions for standard motor truck scales.

The problem of selecting standard sizes and capacities for motor truck scales is somewhat different from that of the other types of scales, as no great variety has yet been manufactured. Considerable data was collected as to all motor truck scales now in use or contemplated, and as to present and prospective highway bridge and roadway limitations, and it was found that the essential types of motor truck scales naturally fell into three main classes or capacities, i. e., for the 3½-ton trucks, the 5-ton trucks and the 7½-ton trucks. A study was made as to the spacing of wheels, disposition of loads on the axles, and the amount of overload used, and typical diagram prepared for each class of trucks. It was found that including 50 per cent overload, the 3½-ton truck would have a total weight of 21,000 lb. with 5,000 lb. on the front axle and 16,000 lb. on the rear axle; the 5-ton truck would have a total weight of 27,000 lb. with 5,000 lb. on the front axle and 22,000 lb. on the rear axle, and the 7½-ton truck would have a total weight of 36,000 lb. with 6,000 lb. on the front axle and 30,000 lb. on the rear axle.

To accommodate these trucks three classes or capacities of scales were decided upon. The 20,000-lb. capacity scale for the 3½-ton truck, 30,000-lb. capacity scale for the 5-ton truck, and the 40,000 lb. capacity scale for the 7½-ton truck.

For the 20,000 lb. capacity scale two sizes were selected, for the 30,000 lb. capacity scale two sizes were selected, and for the 40,000 lb. capacity scale three sizes were selected, making a total of seven standard scales for weighing motor trucks.

From typical truck diagrams the maximum live load main lever reaction was computed for each truck on each side of platform, together with an estimated weight of the weigh-bridge or deck, and corner load factors were thus obtained, which are the maximum for the worst position of the truck on the scale. It was felt by the committee that this method is the only proper one, and when used with the tabulated stresses will give a safe and logical design for such scales.

The sizes and capacities of the scales selected and recommended for standard in this report correspond to a very marked reduction in the number of types now in

use and if adopted will promote economies in the manufacture of scales, and, in all cases, will reduce the variety and amount of repair parts necessary to be carried in stock.

The subject of grain weighing scales has been covered by the Interstate Commerce Commission in its Docket 9009. In their decision on the matters at issue they include specifications for grain weighing scales. Grain weighing scales are considered especially with respect to their use in the buying and selling of grain, whereas the committee considered that its province is limited by requirements of scales used for the purpose of determining freight charges and has acquiesced in the conclusion that there is no occasion, at least at this time, for our attempting to formulate specifications for such scales.

Appendix C—The Proper Relation of Passenger Station Facilities

This report was confined to a consideration of general passenger station facilities exclusive of those provided for the care of equipment. Mail and express facilities were considered only in so far as they affect the size and arrangement of other facilities. On account of the widely differing requirements of through and suburban passenger traffic the study of each should be made separately, and this study has been confined as far as possible to a consideration of the through passenger requirements. Whenever the term "Through Passenger" is used in the report, it applies to that class of trains or passengers as distinguished from suburban or commuter traffic. In order to collect the necessary information to serve as a basis of this study a questionnaire was submitted to the leading railroads and terminal companies of the United States and Canada.

The portion of this report dealing with the size of facilities is based entirely upon the experience of the various stations reported upon, no effort being made to develop a theoretical consideration of this subject.

Each railroad was requested to report upon its largest and most modern station. The stations reported upon, due to the fact that some of the railroads were small and did not have large stations, include all types, from relatively small wayside stations to our largest passenger terminals. This variation in size is necessary to establish the relation which should exist between business handled and the size and arrangement of facilities. An effort has been made to present the information collected in such a manner as to be of value to the designer of small as well as large stations. However, the problems and the construction and operation costs involved in the larger stations are relatively so much greater than in the smaller stations that the major portion of this report, as far as arrangement of facilities is concerned, will deal with the larger stations.

The difficulties to be experienced in endeavoring to establish a fixed relation between business handled and the size and arrangement of facilities can be appreciated when it is realized that the design of every passenger station of any magnitude is affected by local conditions and influences not common to other stations. Frequently in large cities where land is very valuable the size and shape of the land available for the station site plays a very important part in determining the size and arrangement of facilities.

It is the usual practice in constructing a new station to provide more space than then required in order that provision may be made for future growth. It is equally true that in the case of old stations they are usually used after their facilities have been outgrown. It is, therefore, evident that little can be gained in the solution of this problem by a study of existing terminals without due regard to the adequacy of their facilities. Each company was requested, therefore, to furnish information not only as to the size of their existing facilities, but also to the size of facilities which they would recommend as adequate to accommodate their present normal business. The information on existing facilities was shown in the form of tables, while the recommended values were shown in graphical form and represented the relation which should exist between size of facilities and business handled. There is, therefore, with the exception of one table, no relation between the values shown in the tables and those which appear on the graphs. The tables show existing facilities and the graphs show those that are recommended.

It is not surprising that on many of these graphs there is considerable variation from the curve which has been suggested to indicate what appears to be the proper relation between the size of facilities and the amount of business handled. An effort has been made, however, to eliminate the effect of local conditions and extraordinary influences.

In a great many of the new stations the idea of spaciousness and convenience to the traveling public has been paramount. In this country, the tendency in station design in recent years has been toward the monumental type, with a desire to provide a very high standard of service. Naturally an official accustomed to the operation of a station of this type would have more elaborate ideas as to station requirements than one who had been accustomed to operating a station which has been outgrown or one which had been built along more economic lines.

In reviewing the tables it was interesting to note, in the older stations, how much can be accommodated in a limited space, and in the case of newer stations, to observe the provision which has been made for the accommodation of future growth. One of the best examples of the older stations is the Cincinnati Union Station, which was selected for this study for the particular reason that it shows the large amount of business which can be accommodated in a limited area.

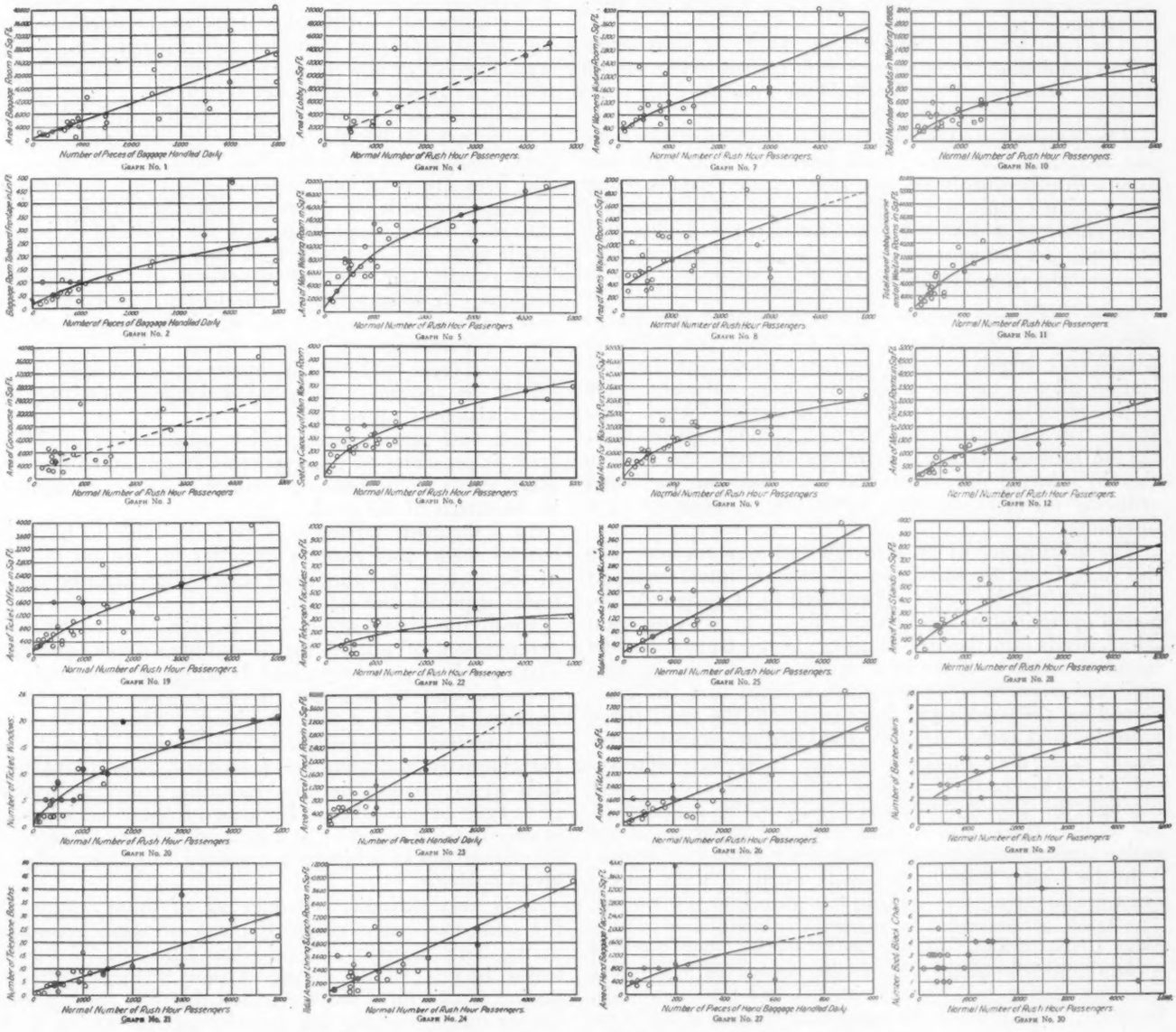
The tendency of traffic to adjust itself to existing facilities even if they are inadequate and the effect which the size of existing facilities has on the estimate of the operating official as to the actual requirements of his station is largely responsible for the wide range in recommended facilities. This can be illustrated by reference to waiting room requirements in the various stations. In most stations there is no means of increasing the size of waiting rooms when an increase in traffic would require enlarged facilities. On the other hand, seats can be added as required to accommodate the increased traffic. In practically all stations, therefore, the total number of seats installed more nearly approximates the present requirements of the station than does the area of waiting room. The operating official, in submitting his recommendations as to the requirements of the station, even though he may be unconscious of the fact, is governed largely by the extent of his present facilities. It is, therefore, natural to suppose that the recommendations of the various stations for waiting room area would be more variable than the recommendations as to the number of seats required. In plotting the recommendations it was observed that this condition actually developed and a very close relation was found to exist between the recommendations of the various roads as to the number of seats required in the waiting rooms, but this relation in the case of waiting room areas was not so pronounced. This general principle applies to practically all facilities. It is particularly noticeable in the study of toilet facilities, where the areas of such facilities do not follow a

uniform relation nearly as well as do the number of toilet fixtures required.

In many of the stations, through and suburban business are handled jointly, making it difficult to accurately estimate the facilities which should be provided to handle only the through business. In a few of the stations the through passenger business was so small in comparison to the amount of suburban traffic that statistics on certain facilities were omitted, as they were of no value in a study of through passenger requirements.

Another reason why a considerable variation in the recommendations from the various stations should be consideration should be given to it in the design of facilities.

In many of the large stations, particularly where traffic from several large roads was accommodated, it was found that no statistics were available to assist the operating official in accurately determining the normal and maximum business. The facilities recommended for each station were based on the requirements of the normal business of that station. Due to these conditions it is only reasonable to expect that a wide variation would develop, as perhaps no two officials estimating on the same stations would approximate the same figures.



Relation of Passenger Station Facilities to Rush Hour Traffic

expected is the fact that on most of the graphs the requirements are plotted in terms of "normal rush hour" business, which itself is not a fixed unit. In the instructions which accompanied the questionnaire normal and maximum business were defined as follows:

Normal business is the amount which is actually handled in the station during the season of heavy traffic and is the amount which has been regularly handled in the station for a reasonable period.

Maximum business is the maximum amount which has been handled in the station with sufficient frequency that

In a review of the graphs which follow, all of these variables should be taken into consideration and the relation between the size of facilities and business handled, which is suggested by the curve, should be considered only as an indication of what practice in the various stations has shown to be adequate. It should not be taken as a positive fixed relation which would be proper in all stations.

Stations may be divided into various types according to the arrangement of main, throat and station tracks.

There are three major types: stub, through and loop.

A *Stub Station* is one in which the station tracks are connected at one end only. The St. Louis Union Station and South Station, Boston, are stations of this type.

A *Through Station* is one in which the station tracks are connected at both ends. The Pennsylvania Station in New York City is an example of this type.

A *Loop Station* is a form of through station in which the station track layout embraces a loop or part of a circle, trains being moved in one direction only and in the operation turned with reference to the station. The Broad Street Station, Richmond, Va., is an example of this type. On account of the large area required for this type of station, its use has been limited.

Combinations of the three types of stations are quite common.

The Union Station, Washington, D. C., is an example of a combination through and stub station. The Grand Central Terminal, New York, is an example of a combination stub and loop terminal.

The Kansas City Union Station is of the through type, but has station tracks of sufficient length to berth two trains simultaneously on the same track. Roads enter this station from either end. It can, therefore, be operated either as a double berth through, or a double stub station.

Factors Affecting Station Capacity

Under intensive operation the number of station tracks necessary for any given number of trains per hour depends very largely on the type of station. In the stub station all movements of equipment in and out of the station must necessarily pass through the one throat. This is not true of the loop and through stations, where most of the movements are continuous through the station, thereby clearing the station tracks in minimum time and reducing interference from conflicting movements to a minimum.

The advantages of the through and loop stations over the stub, from the standpoint of reduced interference at the throat, can be better appreciated by a review of the actual operations in the breaking up of an arriving train which heads into the stub station. If the train is broken up on the station tracks by a switch engine, the baggage, mail and express cars cannot be switched to a track assigned for the working of these cars until the coaches are unloaded and removed. The road engine cannot be released until the remainder of the train has been removed. This cause of delay and excessive movement through the throat necessarily reduces the capacity of the station track and consequently the capacity of the entire station as compared to the other types of stations.

In the Union Station, St. Louis, many of these objections are overcome by backing the train into the station. The track arrangement is particularly adaptable to this form of operation. It has the objection that there is a certain additional amount of time consumed in running past the station and backing in. It has the advantage, however, of permitting the immediate release of the locomotive and the head end equipment, it being possible for them to be removed while the coaches are being unloaded.

In the case of through terminals, the engine and head end equipment on arriving trains can be immediately released independent of the time consumed in unloading the coaches. This method of operation clears the station tracks in minimum time. If the requirements of the station during the rush hour demand, the arriving trains can be moved out of the station as a unit and broken up in an auxiliary yard. This may result in added expense, but it clears the station tracks in minimum time so that they are available for other trains.

The location of the coach, express and locomotive facilities with respect to the main tracks and the throat of the yard has a very direct influence on the number of station and approach tracks required.

If the equipment yards are located a considerable distance from the station the tendency is to handle trains to and from the yard intact with the road engine. While this practice may reduce the number of movements through the throat, it is very likely to increase the standing time in the station to permit the unloading of head end equipment. The usefulness of the station tracks will thereby be correspondingly decreased and a greater number of tracks will be required to handle a given business. Where the mail and express facilities are adjacent to the station tracks, the trains are usually broken up and mail and express cars switched to separate facilities, clearing the station tracks in a shorter time than if this business were handled on the station platforms, but increasing the number of movements through the throat.

In the design of a station, particularly of the stub type, it is important that the coach, locomotive, mail and express facilities be located so that switching movements to and from these various facilities will result in minimum interference with the main line approach tracks. If the station is large, it is frequently desirable to divide the coach yard and locate part on each side of the throat. This practice is followed in several of our large stub stations. It is sometimes desirable to locate one coach yard between the main tracks, which further reduces the crossover movements in the throat. The practice of having several coach yards, however, is not without objection, on account of the possible duplication of facilities and division of supervision.

The new station now under construction at Milan, Italy, is presented in this report as an example of several coach yards so located as to reduce crossover movements in the throat of the yard.

In a through station, it is very desirable to have the coach, engine and express facilities located on the end of the station opposite from which the majority of the trains approach the station.

From the above discussion, it may be seen that the arrangement of station, throat and main tracks and auxiliary yards have a very direct bearing on the capacity of a station and the number of throat and station tracks required to handle a given business. These factors are also governed very largely by the method of operation, the character and amount of business handled particularly as to whether the predominating traffic is through passenger or suburban. Because of these variables, it is very difficult to arrive at a general rule for the number of station tracks which are required to accommodate a given business.

It is very difficult to reduce all of these stations to the same basis on account of many of them accommodating both through and suburban business. Suburban trains, because of the nature of their traffic, occupy the station tracks for a shorter period than the through passenger trains, causing the capacity of the station to be greater for suburban than for through passenger service. The variables previously mentioned, particularly the method of operation at the various stations, make a direct comparison very difficult. By referring to the data under the heading, "Maximum number handled on any one station track in one hour," it was seen that there was a very decided advantage in favor of the through stations. This advantage, however, is less pronounced when the entire station is considered.

The advantages of the through over the stub station, from a capacity standpoint, decreases as the standing time of the trains in the trainshed increases, since the time required to clear the station tracks represents a

smaller portion of the cycle of operation. For this reason, the objection to a stub terminal for through passenger service, particularly where, because of requirements of service, a long standing time in the station is desired, is not as great as for suburban service where the loss of time getting in and out of the station represents a large proportion of the total time involved.

It is a significant fact that in reply to the questionnaire several roads now operating stub stations called attention to the difficulties experienced in these stations from an operating standpoint and strongly recommended wherever possible stations of the through type.

From the foregoing discussion it will be seen that the number of station tracks required to accommodate a given business depends on the character of business, method of operation, type of terminal and design of throat. Each station must be analyzed individually, as the length of time necessary to clear the throat depends very largely on its size and design. As a general proposition, however, it might be safely stated that for through passenger train operation under normal conditions, particularly in large stations, a stub station will accommodate on an average approximately two trains per track per hour, and in a through station between two and three trains per track per hour.

General Information on Stations Covered in the Report

	Name of Station	Location of Station	Date of Construction	Type of Station*			Grade of Station Tracks*		Location of Station Building		
				Stub	Through	Loop	At Street Level	Above Street Level	Below Street Level	End of Tracks	Side of Tracks	Over Tracks
1	Union	Cincinnati, O.	1884	x	..	..	..	..	x	x	..	..
2	Windsor St.	Montreal, Canada.	1889	x	..	..	..	x	..	x	..	..
3	Central	Chicago	1893	..	x	..	x	..	..	..	..	x
4	Union	Providence, R. I.	1898	12	8	..	..	x	..	..	x	..
5	South	Boston, Mass.	1899	x	..	..	x	..	..	x	..	..
6	Union	Shreveport, La.	1890	x	..	..	x	..	..	x	..	..
7	Main St.	Richmond, Va.	1901	4	5	..	..	x	..	x	..	..
8	La Salle St.	Chicago	1903	x	..	..	..	x	..	x	..	..
9	Union	St. Louis, Mo.	1894	x	..	..	x	..	..	x	..	..
10	Union	Washington	1907	21	9	..	20	..	10	x	..	..
11	C. & E. I.	Evansville, Ind.	1907	x	..	..	x	..	..	x	..	..
12	Southern	New Orleans, La.	1908	x	..	..	x	..	..	x	..	..
13	N. P.	Tacoma, Wash.	1909	..	x	..	..	..	x	..	x	..
14	Union	Ottawa, Canada.	1910	6	2	..	..	..	x	x	..	..
15	Pennsylvania	New York	1910	..	x	..	..	..	x	..	..	x
16	O.W.R.R. & N.	Seattle, Wash.	1911	x	..	..	..	..	x	x	..	..
17	C. & N. W.	Chicago	1911	x	..	..	..	x	..	x	..	..
18	C. G. W.	Oelwein, Iowa.	1912	..	x	..	x	..	..	..	x	..
19	16th St.	Oakland, Calif.	1912	..	x	..	x	..	..	..	x	..
20	C. B. & Q.	Galesburg, Ill.	1912	..	x	..	x	..	..	..	x	..
21	A. C. L.	Wilmington, N. C.	1913	x	..	..	x	..	..	x	..	..
22	Grand Central	New York	1913	20	..	5	..	..	x	x	..	..
23	Union	Kansas City	1914	..	x	..	..	..	x	..	x	..
24	M. K. & T.	Parsons, Kan.	1914	..	x	..	x	..	..	..	x	..
25	Union	Wichita, Kan.	1914	..	x	..	..	x	..	..	x	..
26	Great Northern	Minneapolis	1914	..	x	..	..	..	x	..	..	x
27	M. C. R. R.	Detroit, Mich.	1914	..	x	..	..	x	..	..	x	..
28	Grand Central	Memphis, Tenn.	1915	5	5	..	..	x	..	..	..	..
29	Lehigh Valley	Buffalo, N. Y.	1916	x	..	..	..	..	x	x	..	..
30	Lackawanna	Buffalo, N. Y.	1916	x	..	..	..	x	..	x	..	..
31	Union	Macon, Ga.	1916	8	8	..	..	x	..	..	x	..
32	Union	Dallas, Texas.	1916	..	x	..	x	..	..	..	x	..
33	C. & E. I.	Danville, Ill.	1917	..	x	..	x	..	..	..	x	..
34	Union	Denver, Colo.	1880	..	x	..	x	..	..	..	x	..
35	Broad St.	Richmond, Va.	1919	..	..	x	..	..	x	..	x	..
36	Union	Jacksonville, Fla.	1919	14	6	..	x	..	..	x	..	..
37	Union	Little Rock.	1921	..	x	..	..	..	x	..	x	..
38	Union	Toronto, Canada.	1922	..	x	..	..	x	..	..	x	..
39	Union	St. Paul, Minn.	1922	8	12	..	..	..	x	..	x	..
40	Union	Indianapolis	....	..	x	..	..	x	..	..	x	..
41	Union (New)	Chicago	Und.	x	x	..	..	..	x	..	x	..
42	Ft. Garry	Winnipeg, Canada.	....	..	x	..	..	..	..	..	..	..

*Where station is a combination of different types, or where tracks are at different elevation, the number of tracks applicable to each type or elevation is shown.

Conclusions

1. The through and loop types of stations are superior to the stub station from the standpoint of train operation.

2. The number of station and approach tracks required to handle a given traffic depends on type of station, location of coach and locomotive facilities, size of station, length of station tracks, character of traffic, design of throat and method of operation.

3. For through passenger train operation a stub terminal station will accommodate on an average approximately two trains per track per hour, and a through terminal station between two and three trains per track per hour.

4. A ratio of from 2.5 to 3 station tracks to one throat track should be adequate if the throat is properly designed.

5. All stations should have a sufficient number of long station tracks to accommodate the longest trains, and in order to assure flexibility, it would be preferable to have all tracks of this length.

6. Station platforms built at car-floor level are superior to those built at the level of the top of rail, in that the hazard and inconvenience resulting from the use of car steps are eliminated and the handling of passengers is expedited. It should be stated, however, that the high platforms interfere with the inspection of equipment.

7. There are many advantages to the use of separate platforms for trucking and for passengers, as station operation is facilitated and passengers are saved the annoyance of the trucking operations. It is very probable that a station constructed with separate platforms and a corresponding reduction in the number of station tracks will have equal capacity with a station in which combination platforms are provided and which occupies the same area, due to the increased capacity per track in the station with separate platforms.

8. The requirements of through passenger and suburban service are so dissimilar that it is desirable to make a complete separation of the two classes of service.

9. Ramps are very desirable in stations where their use does not increase the distance traveled to reach a given point, and where the gradients are not in excess of 10 per cent. They greatly expedite the handling of crowds and facilitate the operation of invalid chairs, which is not possible on steps.

10. The principal station facilities, such as information booth, ticket office, baggage check counter, parcel check room, etc., should be located in proper sequence along the line of travel and clearly indicated so as to avoid confusion and reduce the walking distance of passengers to a minimum.

11. A complete separation of inbound and outbound traffic, particularly in large stations, is very desirable, so that there will be no conflict between lines of travel moving in opposite directions, provided that the design permits of prompt handling of passengers transferring from one train to another.

12. The practice of constructing rentable office space in connection with passenger stations under proper circumstances offers opportunities for assisting in carrying the interest charge resulting from the construction of stations.

13. If the station building is surmounted by an office building, the entrances to the latter should be independent of the station so that office employes will not be required to pass through the station. Consideration, however, should be given in the design of certain station facilities to the possible patronage of occupants of the office building.

14. A passenger concourse is very desirable and is used effectively in many stations as an exit passageway, which permits arriving passengers to reach the street without passing through the station.

15. The required width of passenger concourse depends upon the character and amount of traffic and number of entrances and exits from the concourse.

16. A train concourse is advantageous, as it permits serving of one station platform by several train gates or conversely the serving of several platforms from one train gate. In stub stations it permits trucking from one platform to another without entering the passenger concourse.

17. A width of 20 ft. for a train concourse is adequate if it is not used extensively for trucking.

18. The waiting rooms should be located to one side of the line of travel, but near to the passenger concourse and adequately equipped with bulletin boards, clocks, and other information devices, so that passengers will be content to remain in the waiting room and not unnecessarily occupy the passenger concourse.

19. The practice of installing pay toilets is increasing. They are favorably considered where installed and are the source of a substantial revenue.

20. Ticket offices should be located adjacent to the direct line of travel, but should be so arranged that passengers waiting to secure tickets will not interfere with the general flow of traffic.

21. The parcel check rooms should be easily accessible for both inbound and outbound passengers and should have every facility for handling parcels quickly. Where the amount of business justifies, separate counters should be provided for receiving and delivering parcels.

22. The extent of cab facilities depends on the size of the city, character of taxicab service and other means of local transportation. In cities where good taxicab service is provided at a reasonable rate an ever-increasing per cent of passengers is using that service as a means of reaching and leaving the station.

23. Concessions of the proper character have proven very profitable in most stations and are desirable not only from a revenue producing standpoint, but as a facility which adds to the comfort of the passenger.

24. The relation which should exist between business handled and the size of facilities is subject to variation due to local conditions, class of traffic, type of service rendered, outside competition, large variation in estimates of normal rush-hour business handled and the varying ideas of what constitutes adequate service.

Discussion

(The presentation of this report was directed primarily at the matter relating to passenger stations. A. Montzheimer, chairman, introduced C. H. Mottier, chairman of the sub-committee, who outlined the report.)

L. S. Rose (C. C. C. & S. L.): I would like to ask the committee why they take the rush-hour passenger period rather than the normal passenger period for the basis of designing facilities.

Mr. Mottier: It does not make any difference what unit you use as long as the operating officer bases his figures on the volume of business. The committee used its own judgment in establishing the normal rush-hour business that was used in the graphs.

Mr. Rose: In conclusion No. 6, on high platforms, the committee does not say anything about interference with switching. The high platform would be a nuisance for trainmen switching cars.

Mr. Mottier: There is some weight to the criticism that has just been raised. Where there are separate trucking and passenger platforms, the trucking platforms could be made of the low type and the switching could be done from the low platform.

Mr. Rose: It is bad for the car inspectors, to have a high platform, but it is worse for the switchmen.

G. D. Brooke (B. & O.): I want to endorse what Mr. Rose has said, because I think that is an extremely important feature. Referring to the last sentence in recommendation No. 7, in which the position is taken that equal capacity to what might be termed the usual platform can be gained by separate platforms for trucking and for passengers. It does not seem to me that this can be borne out.

Mr. Rose: The conclusion recommends tracks of maximum length. It seems to me with two or three shorter tracks we can save some switching.

J. V. Hanna (K. C. Term.): I think there is some force in the last remark about making all of the track of maximum length. I don't believe there is a condition anywhere where you would make use of that number of long tracks.

(Various objections were made to the recommendations, but on a vote they were adopted for inclusion in the Manual.)

Chairman Montzheimer: *I move that the definitions of stub station, through station and loop station, Appendix C, be approved for publication in the Manual.*

(*Motion carried.*)

The President: This completes the report of this committee, and I am sure the association's thanks are very sincerely extended to the committee for the fine work that it has done.

(*The committee was excused with the thanks of the association.*)

Report of the Committee on Electricity

The committee took up the study of water power with respect to the sources available in the United States and Canada for the electric operation of steam roads. The report listed government maps showing existing power stations and transmission lines. During the year, the committee cooperated with the United States Bureau of Standards in the revision of the National Electric Safety Code and reported the result of this work in Appendix E. The principal work of the committee comprised a complete revision of the specifications for electric light power supply and trolley lines crossing steam and electric railways with a view to bringing these specifications up to date as well as to correct inaccuracies. These specifications, including appended tables, charts and diagrams, were submitted in Appendix H as recommended practice. The committee also completed its tentative specifications for adhesive insulation tape, which it submitted as recommended practice. In Appendix L, the committee submitted for adoption a revised set of rules for the protection of sidings from stray currents. The rules are in conformity with the requirements of the Bureau of Explosives of the A. R. A.

E. B. Katte
Chairman

E. B. Katte has served as chairman for six years and twelve years as a member of the committee.

THE COMMITTEE in its action recommended:

1. That the changes in and additions to the Manual recommended in Appendix A be approved.

2. That the report on Electrical Interference in its Appendix B be accepted as progress and the subject continued.

3. That the report on Water Power in Appendix C be accepted as information, printed in the Proceedings and the subject continued.

4. That the report on Electrolysis in its Appendix D be accepted as information, printed in the Proceedings and the subject continued with representation on the American Committee on Electrolysis without commitment as to subscription or dues. That further report on the "Effect of Electrolysis on Reinforced Concrete" be discontinued, at least for the present.

5. That the report on coöperation with the U. S. Bureau of Standards contained in its Appendix E be accepted as information, printed in the Proceedings and continued coöperation be authorized with the U. S. Bureau of Standards.

6. That the report on Overhead Transmission Line Construction in its Appendix F be accepted as progress and the subject continued.

7. That the report on Collaboration with Committee XVI—Economics of Railway Location, in its Appendix G be accepted as progress and the subject continued.

8. That the revised Railroad Specifications for Electric

Light, Power Supply and Trolley Lines Crossing Railways in its Appendix H be approved as recommended practice and printed in the Manual.

9. That the Specifications for Adhesive Tape for General Use for Electrical Purposes and the Specifications for Rubber Insulating Tape in its Appendix I be approved as recommended practice and printed in the Manual.

10. That the report on Standardization of Insulators, Knife and Snap Switches in its Appendix J be accepted as progress and the subject continued.

11. That the report on Clearances for Third Rail and Overhead Working Conductors in its Appendix K be accepted and the 1921 tables showing third rail and overhead clearances be revised and brought up to date next year.

12. That the rules relative to the Protection of Oil Sidings from Danger Due to Stray Currents in its Appendix L be approved as recommended practice and printed in the Manual.

Committee: Edwin B. Katte (N. Y. C.), chairman; D. J. Brumley (I. C.), vice-chairman; H. M. Bassett (N. Y. C.), R. Beeuwkes (C. M. & St. P.), R. D. Coombs (Con. Eng.), J. C. Davidson (N. & W.), J. H. Davis, J. V. B. Duer (Penna.), G. Eisenhauer (Erie), R. H. Ford (C. R. I. & P.), E. D. Hall, (B. & M.), J. L. Harper (Niagara Jct.), G. W. Kittredge (N. Y. C.), W. L. Morse (N. Y. C.), A. E. Owen (C. of N. J.), Martin Schreiber (Public Service Ry.), E. B. Temple (Penna.), W. M. Vandersluis (I. C.), H. M. Warren (D. L. & W.), L. S. Wells (Long Island), Sidney Withington (N. Y. N. H. & H.).

Appendix A—Revision of Manual

The committee recommended the following changes in and additions to the Manual:

Present Form.—Railroad Specifications for Electric Light, Power Supply and Trolley Lines Crossing Steam and Electric Railways. Page 609.

Proposed Form.—Railroad Specifications for Electric Light, Power Supply and Trolley Lines Crossing Railroads, as recommended practice (Revised October 5, 1922).

Specifications for Adhesive Tape for General Use for Electrical Purposes, presented as recommended practice (1922).

Specifications for Rubber Insulated Tape, presented as recommended practice (1922).

Rules for the Protection of Oil Sidings from Danger Due to Stray Currents as recommended practice (1922).

Appendix C—Water Power

The committee reported on water power available, both in the United States and Canada, for the electric operation of steam railroads.

United States Government Maps

Attention is called to maps showing power stations and transmission lines used in public service, prepared by the chief hydraulic engineer and chief, Division of Power Resources. These maps list the operating companies and show the location of the following stations: hydro-electric, fuel consuming and combined hydro-electric and fuel consuming generating stations, sub-stations and switching stations; also are shown the distributing companies and primary transmission lines.

Nine maps thus far issued are as follows:

States	*Dated*
Maine	1922
New Hampshire and Vermont	1921
Masschusetts, Rhode Island and Connecticut	1919
New York	1921
New Jersey	1921
Pennsylvania	1920
Maryland, Delaware and District of Columbia	1922
Indiana	1922
Virginia	1922

These maps may be obtained from the United States Geological Survey at Washington.

Developed and Potential Water Power of the United States

In 1908 the Bureau of the Census made a special census of the developed water powers of the United States for the report of the National Conservation Commission. This census showed that there were in the United States 31,537 water-power plants of all sizes, whose water-wheel capacity was 5,356,680 horsepower. Of these plants 602 had water-wheel capacity of more than 1,000 horsepower; the total capacity of these 602 plants was determined to be 3,900,000 horsepower, leaving 1,457,000 horsepower distributed among 30,935 plants.

In 1921 the U. S. Geological Survey made a compilation of data showing the developed water power in the United States in plants of 100 horsepower or more. This data shows that at present there are in the United States 3,120 water-power plants of 100 horsepower or more, with a total capacity of installed water wheels of 7,926,958 horsepower. Of this total 78 per cent is in public-utility plants and 22 per cent in manufacturing plants.

New York is the leading State in the amount of developed water power, with 1,291,857 horsepower; California a close second, with 1,149,099 horsepower; Washington is third, with 454,356 horsepower; Maine closely follows in fourth place, with 449,614 horsepower; and Montana is fifth with 344,420 horsepower.

It is the general practice in the construction of water-power plants to install hydraulic machinery capable of utilizing strong flow far in excess of the absolute minimum and much in excess of the flow used in determining the minimum potential water power as given in the table. This practice is forcibly brought out by comparing the minimum potential water power with the total capacity of water wheels installed in water-power plants in some of the New England States. If all the water power of the United States were to be similarly developed it would probably be necessary to install plants having three or four times the capacity of the estimated minimum potential water power as given in the table. This condition should be fully considered in estimating the amount of potential water power that may still be available in any State at the present time.

DEVELOPED WATER POWER IN THE UNITED STATES

(Capacity of water wheels installed in plants of 100 horsepower or more.)

Section	Total No. of Plants	Total Capacity in H. P.	Public Utility No. of Plants	Public Utility Capacity in H. P.	Manufacturing and Miscellaneous No. of Plants	Manufacturing and Miscellaneous Capacity in H. P.
New England	1,234	1,310,507	246	583,130	988	727,377
Middle Atlantic	551	1,478,904	215	1,167,539	336	311,365
East North Central	323	738,663	192	542,889	131	195,774
West North Central	179	444,396	112	360,625	67	83,771
South Atlantic	264	1,076,909	128	799,767	136	277,142
East South Central	43	245,534	25	228,380	18	17,154
West South Central	26	16,274	12	12,515	14	3,759
Mountain	223	827,101	173	806,472	50	20,629
Pacific	277	1,788,670	220	1,699,063	57	89,607
United States	3,120	7,926,958	1,323	6,200,380	1,797	1,726,578

POTENTIAL WATER POWER RESOURCES OF THE UNITED STATES

Section	Minimum Horse Power	Minimum Per Cent	Maximum Horse Power	Maximum Per Cent
New England	868,000	3.11	1,605,000	2.98
Middle Atlantic	1,357,000	4.86	2,488,000	4.62
East North Central	832,000	2.98	1,604,000	2.98
West North Central	902,000	3.23	1,956,000	3.63
South Atlantic	2,346,000	8.39	4,257,000	7.90
East South Central	1,087,000	3.89	1,964,000	3.64
West South Central	353,000	1.26	822,000	1.52
Mountain	8,694,000	31.11	16,131,000	29.92
Pacific	11,504,000	41.17	23,078,000	42.81
United States	27,943,000	100.00	53,905,000	100.00

Canada

During the past year, Water Resource Papers No. 28 and No. 29 have been issued by the Department of the

Interior and the Dominion Water Power Branch. No. 28 gives hydrometric data for the Province of Ontario, except that for the Winnipeg River and its tributaries, and shows the surface water supply for St. Lawrence and Hudson Bay Drainage. No. 29 gives the hydrometric data for the three provinces of Nova Scotia, New Brunswick and Prince Edward Island, and shows the surface water supply for the Atlantic Drainage south of the St. Lawrence River.

Appendix E—Co-operation With the U. S. Bureau of Standards

Coöperation with the U. S. Bureau of Standards, with regard to the revision of the National Electrical Safety Code, has been through the medium of the American Engineering Standards Committee. A conference was called at the request of the American Electric Railway Association and held March 2, 1922, in the rooms of the National Electric Light Association in New York City. The following was the suggested addenda:

1. "Shall there be a set of national specifications for crossings between overhead electric wire lines and railways and between different wire lines."
2. "If so, what should be the relation of Part 2 of the National Electrical Safety Code, 'Rules for the installation and maintenance of overhead and underground electrical supply and signal lines.'"
3. "Can disposition be made of the differences of opinion on Part 2 of the National Electrical Safety Code by,
   (a) "Approving the present edition.
   (b) "Revising the present edition through a Sectional Committee of the American Engineering Standard Committee."
4. "What procedure should be recommended to carry out the conclusions reached by the conference."

There was appointed by the American Railway Association to attend this conference twelve representatives. The conference resulted in the somewhat unusual action of the adoption by the American Engineering Standards Committee of the U. S. Bureau of Standards' National Electrical Safety Code with the proviso that Part 2 thereof would be subjected immediately to revision by a sectional committee. The following resolution was unanimously adopted by the conference:

"Resolved, That it is the opinion of this conference that:

1. "The remaining differences of opinion on Part 2 of the National Electrical Safety Code are small, and the different interests are approaching agreement, and that it is therefore advisable.
2. "That the National Electrical Safety Code should be approved by the American Engineering Standards Committee with the understanding that
3. "There should immediately be organized a thoroughly representative sectional committee under the procedure of the American Engineering Standards Committee to consider any revisions of Part 2 of the Code which may be deemed necessary by any of the interested parties, and
4. "That there should be a set of national specifications for crossings between overhead electric wire lines and railways and between different wire lines, because there is disagreement among the existing specifications, and that
5. "Such specifications should be prepared by thoroughly representative sub-committees so as to make them in agreement with the code, with such revisions as may be made under the provisions of paragraph 3 above."

It was further recommended that the American Railway Association be requested to submit its wire crossing specifications to the sectional committee for consideration and it was finally voted that the chairman be authorized to appoint a committee to confer with the Bureau of Standards with regard to a thoroughly representative sectional committee.

It will be noted that while the conference was called to determine whether "there should be a set of national specifications for crossings between overhead electric wires and railways and between different wire crossings," that the primary recommendation of the conference was the approval of the National Electrical Safety Code with provision for certain revisions. When the resolutions came before the Main Committee of the A.E.S.C. the representative of the A.R.A. took exception to the approval as standard of a Code which was known to be in need of immediate revision. Nevertheless, the A.E.S.C. by letter ballot approved the National Electrical Safety Code and published its action by circular under date of July 10, 1922, at the same time announcing the formation of a sectional committee to consider revisions of Part 2 of the Code.

Appendix H—Wire Crossing Specifications

A complete and careful revision of the Railroad Specifications for Electric Light, Power Supply and Trolley Lines Crossing Steam and Electric Railways as printed in the Proceedings, Volume 21, page 208, has been made during the past year with the view of bringing these specifications up to date, correcting inaccuracies and making them conform, so far as is consistent with established railroad standards, with the requirements of Part 2 of the National Electrical Safety Code prepared by the U. S. Bureau of Standards. The attached specifications with the appended tables, charts and diagrams are submitted as recommended practice.

Because of the activity of Public Service Commissions in the various states with regard to wire crossing specifications, it seemed advisable that there should be a representative of the Committee on Electricity in each state and the Board of Direction authorized under date of March 13, 1922, the appointment of such representative with an alternate in each state. A list was prepared of these representatives and their alternates and it is suggested that members of the Association having transmission line crossing problems confer direct with the representatives of the Committee on Electricity assigned to the state where the crossing is in question.

Appendix L—The Protection of Oil Sidings From Danger Due to Stray Currents

These rules are for general application under conditions as outlined, and are in conformity with the requirements of the Bureau of Explosives of the American Railway Association. Points on unusual conditions or questions on application of the rules will be decided by individual railroads.

1. On sidetracks or yards where inflammable liquids having flash point of 30 degrees Fahrenheit or below are loaded or unloaded from cars, steamers or barges, the following precautions are recommended.

(A) Side Tracks Not Electrically Equipped

2. The rails of such side tracks or yards should be electrically separated from all other track rails by the installation of "insulating rail joints of approved type."
3. Permanent electrical connection of not less than No. 0 copper should be made between the rails on which the tank car stands and piping system used in connection with the handling of the inflammable liquid. Where inflammable liquids are handled to and from steamers or barges a permanent connection should also be made to the water. This connection may be accomplished in two ways: the rails may be bonded by means of standard rail bonds, No. 0 connection being made between both ends of the track section and the permanent oil pipes; or a similar connection between each rail on which the cars are spotted and the permanent oil pipes.
4. All bond connections should be carefully inspected to insure that they are in proper condition at all times.

(B) Side Tracks Electrically Equipped

5. If it is necessary that tracks in electrified territory be equipped with trolley or third rail there should be insulating track joints installed, as in non-electrified tracks, between the loading

or unloading location and the main tracks or other parts of the siding. In this case, an adequate return conductor, independent of the rails, should be installed from the rail at the loading or unloading location to a switch which short-circuits the insulating joints. This switch should be interlocked with the switch controlling the supply of power. The trolley or third rail should normally be dead and grounded and the negative return switch open.

6. Under special conditions where the foregoing provisions are impracticable, permanent and temporary connections referred to may be omitted, in which case discharge to or from tank car should be through *non-metallic* hose of sufficient length to prevent metallic contact between the pipes and car or rails.

Discussion

(The report of the Committee on Electricity was presented by E. B. Katte, chairman, and by the various chairmen of the sub-committees, who outlined briefly the work covered by the sub-committees and presented in turn the recommendations regarding the disposition of each report. These recommendations, which are given at the beginning of the report, were accepted without discussion and the committee excused with the thanks of the association.)

Report of Committee on Records and Accounts

The Committee on Records and Accounts presented two final reports, one of which, namely, Conventional Signs for Architectural Details, was recommended for inclusion in the Manual. The other subject was the feasibility of reporting engineering data in graphic form, and is one on which the committee has been working for a number of years. A list of references on this subject, prepared by the cataloguer of the library of the Bureau of Railway Economics, was presented last year. The committee had no report this year on plans, methods and forms for gathering and recording data for keeping the physical and valuation records of the railways up to date. It was recommended that this subject, as well as one on the feasibility of reducing the number of forms in the engineering and maintenance of way departments, be reassigned. The study of methods and forms for keeping seniority records was discontinued. The committee has been collaborating with the Committee on Economics of Railway Operation on methods for recording and accounting for the determination for proper allowances of maintenance expenses due to increased use and increased investment. H. M. Stout, record engineer, Northern Pacific, is completing his third year as chairman and ninth year as member of this committee.

H. M. Stout
Chairman

In Appendix A, the committee submitted for information a long report on the feasibility of reporting engineering data in graphic form. This report discussed the various forms of charts which can be used to advantage as well as the various classes of engineering data which lend themselves readily to this form of representation, giving recommendations as to the most practical type of representation for each class of data. In Appendix D the committee presented conventional signs for architectural details and recommended that they be approved and published in the Manual.

Committee: H. M. Stout (N. P.), chairman; Henry Lehn (N. Y. C.), vice-chairman; E. E. Ballard (M. K. & T.), A. M. Blanchard (G. T.), W. A. Brewer, H. Bortin (Con. Engr.), H. A. Campbell, Armstrong Chinn (C. B. & Q.), R. A. Cook (C. & A.), A. C. Copland (C. & O.), E. B. Crane (C. M. & St. P.), H. C. Crowell (Penna.), K. B. Duncan (G. C. & S. F.), W. C. Harvey (C. G. W.), Lee Perkins (Engr.-Acct.), L. P. Rossiter (L. V.), H. J. Sargent (Wab.), H. F. Sharpley (C. of Ga.), C. W. Simpson (D. L. & W.), W. A. Van Hook (Roberts, Pettijohn, Wood Corp), V. R. Walling (C. & W. I.), G. R. Walsh (M. P.), W. D. Wiggins (Penna.).

Appendix B.—Conventional Signs for Architectural Details

The committee issued a questionnaire to 12 architectural firms and 23 schools teaching architecture. The architects and schools were so chosen as to develop a national and international view of the need of compiling a list of symbols that later could be standardized or adopted as good practice. The replies to the questionnaire indicate a need for the adoption of a uniform list of architectural conventional signs.

The committee redrew the "List of Conventional Signs for Architectural Details," submitted at the last convention for publication in the Proceedings, attempting to group them into the various trades to which they apply.

It has been found that such a list of symbols is needed and, if made available, will be of such use to the architectural departments of the railways as the topographical symbols, now published in the Manual, are of use to the map draftsmen in the engineering departments of the railways. Hence it was recommended that Exhibit A be adopted for publication in the Manual.

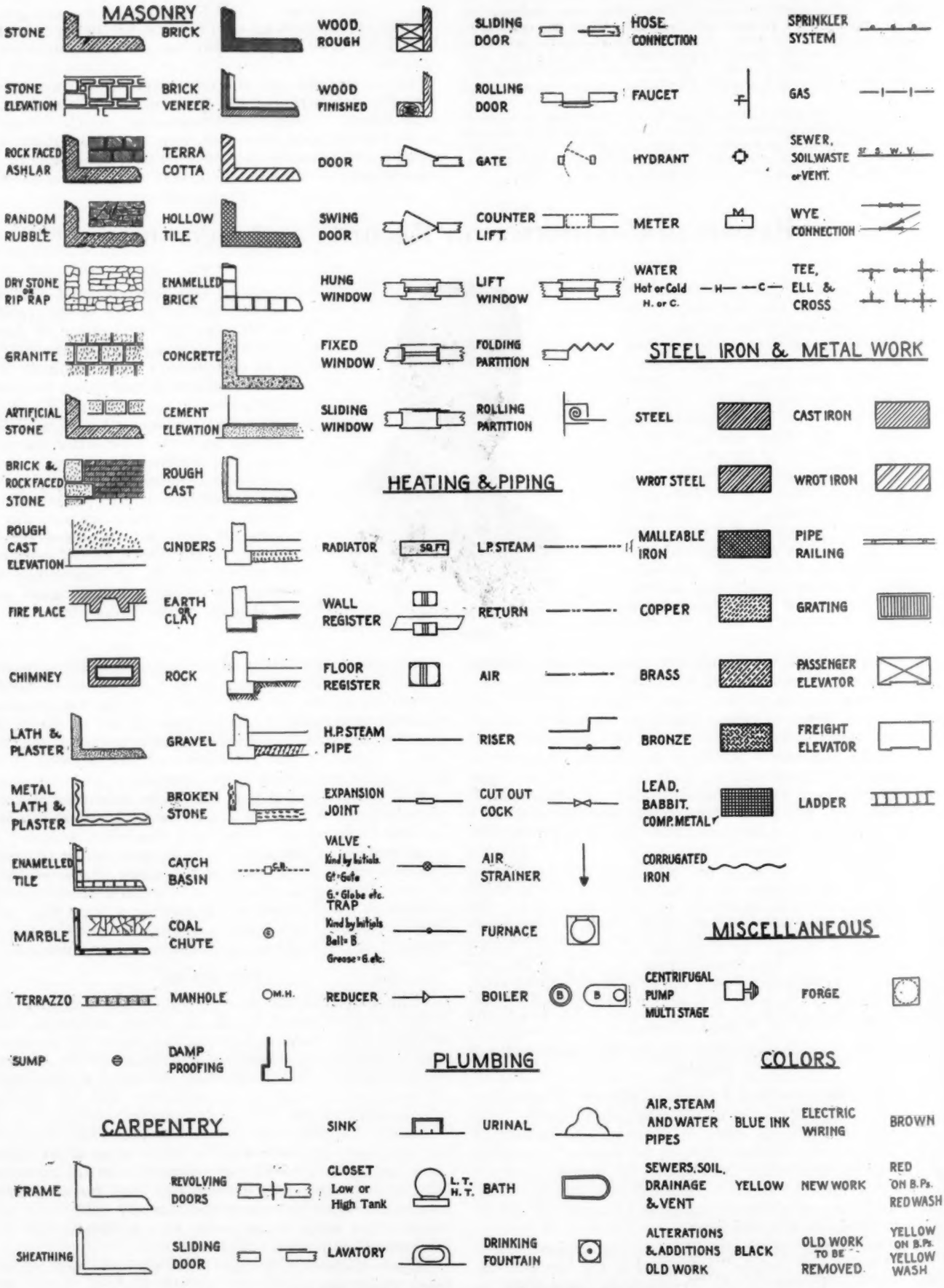
It is not contended that the list as submitted is complete in itself, but that it is a collection of those symbols in most common use today, and that when accepted as good practice it will form a basis upon which revisions can be made, if found necessary. Again, by the adoption of the list as good practice it is readily seen that the tradesmen will become so familiar with them that only brief description of the kind and class of work would be required in the building specifications of any project.

Discussion

(The report of the Committee on Records and Accounts was presented by H. M. Stout, chairman, *who moved that Appendix B, Conventional Signs for Architectural Details, be approved for publication in the Manual. Motion carried.* Mr. Stout then presented a supplemental report on work done in connection with the Bureau of Accounts of the Interstate Commerce Commission.)

John R. Leighty (Pres. Conf. Com.): It is important and absolutely necessary that we know more about where our money goes than we can tell now from the accounts kept under the present classification. You cannot get the cost of any item of maintenance on any railroad in the country that keeps its accounts in accordance with the Interstate Commerce Commission.

Maurice Coburn (Penna.): We ought to have figures from which we could find out the cost of things, not only for the management but for the rank and file. We



Conventional Signs for Architectural Details

want the details, not only the lump sums. We should use every effort to bring before the Commission our fundamental needs. We want to train the engineer's judgment, and you can only do it by a very different system of accounting than we have now.

E. H. Lee (C. & W. I.): Here is the situation, and it is much more fundamental than training engineers. We, as engineers, in the final analysis, are going to be responsible to our companies for the revenue they are permitted to receive in a great many cases. If we fail to secure such a segregation of these primary accounts, and when I say primary accounts I mean going right back to the basic accounts along the road, the time book, material account on the section, if we fail to institute such a process that we cannot get right back to bedrock, on which we must stand, what have we done? We have simply permitted a process to grow up which will not stand the test in a court of law. Nothing in the way of valuation of our railroads will be of much moment unless it is valid evidence which could be supported in such a court.

Edwin F. Wendt: In 1920 the Transportation Act was passed. That act, as you know, requires many things to be done which were never done before, one of which was the determination of depreciation. I recommended at that time to the Director of the Bureau of Accounts that he seek the co-operation of the A. R. E. A., but that co-operation could not be secured. While we did not co-operate two years ago, we are now forced, by virtue of circumstances, to co-operate at this time in the determination of a proper classification of operating expenses, to go into this question of depreciation, which might be called maintenance approval. I want to suggest to the Board of Direction and to this committee that it will be necessary, in my judgment, to send a small committee to Washington and have that committee practically live in Washington until this subject has reached a conclusion. A proper order of procedure would be to determine first a proper classification of investment for steam roads and then to determine a proper classification of operating expenses.

There is a fundamental economic principle which must be followed if a proper classification is provided for investment and a proper classification is provided for expenses. This fundamental question is: what constitutes capital? There are some errors in the present classification of investment and these errors are based upon different conceptions of what constitutes capital as distinguished from operation.

C. C. Cook (B. & O.): As I understand the situation, the accounting officers are in favor of the reduction in the number of accounts. The engineer does not want the combination of accounts. He wants at least as much of a segregation as we have now, or even finer segregation. I would like to know if the committee knows, or if Mr. Wendt knows, whether the Interstate Commerce Commission, Bureau of Accounts, favors the reduction in the number of accounts proposed by the Railway Accounting Officers' Association.

Chairman Stout: I think I can answer that question in the negative. At the presentation of the Disbursement Committee's scheme at Cleveland to the association, Mr. Wylie was present. He did not agree at all with the wholesale reduction in accounts, as proposed by that committee.

Mr. Coburn: *I move that the Board of Direction of the association co-operate with the American Railway Association, with a view of securing representation of this association at Washington, while the revision of the accounts is in progress.*

(*Motion carried.*)

(The committee was excused with the thanks of the association.)

Report on Wooden Bridges and Trestles

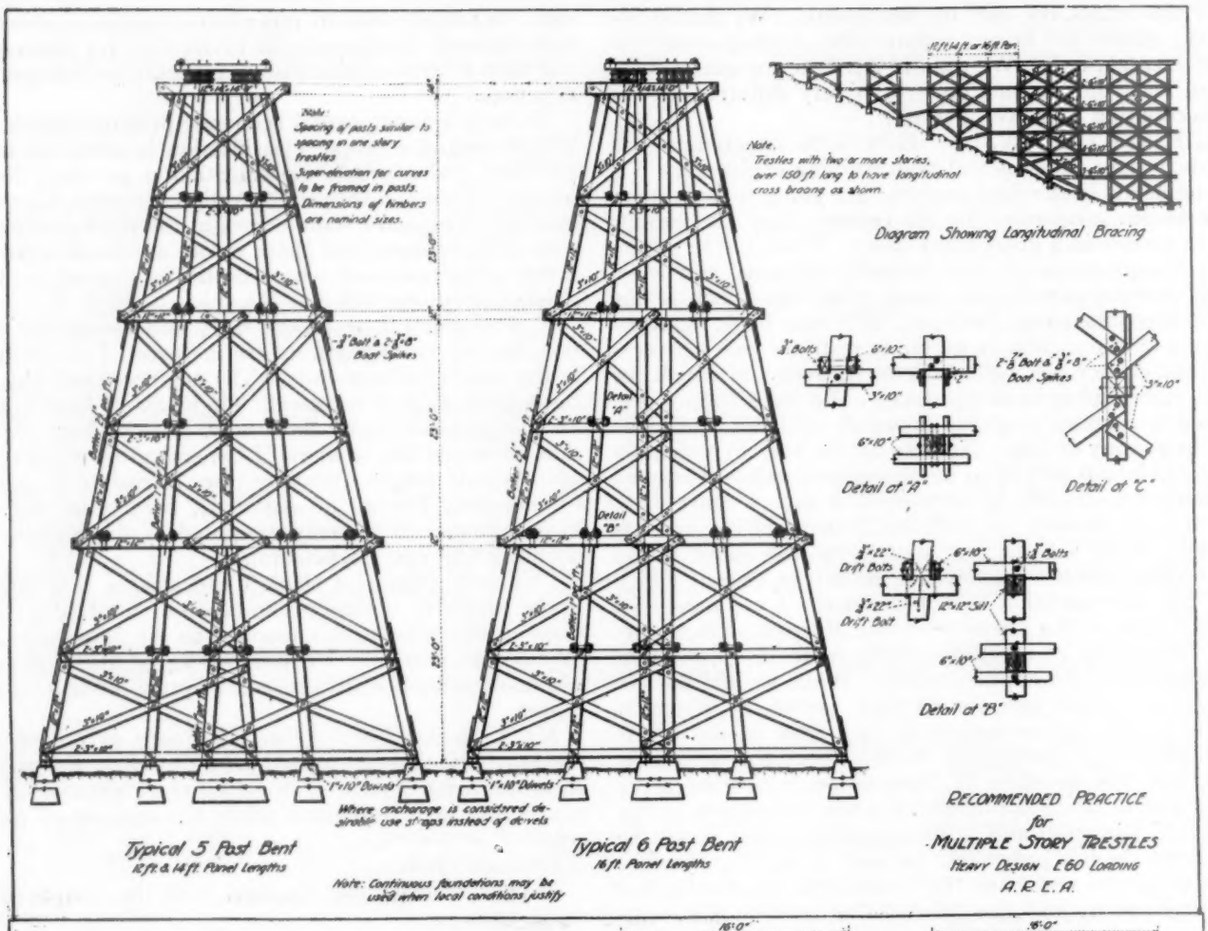
At the meeting of the Association in 1922 plans were submitted for open deck pile and frame trestles, multiple story trestles and ballast deck trestles, for inclusion in the Manual. The plans for the open deck types were not accepted and were presented again this year with revisions. Some slight changes were also offered and recommended for the multiple deck and ballasted deck types. Studies on the useful strength of new, old and treated timbers in trestle work and on the classification of the uses of timber and lumber were also presented. The committee suggested the assignment of the subject of the relative merits of open and ballast deck trestles.

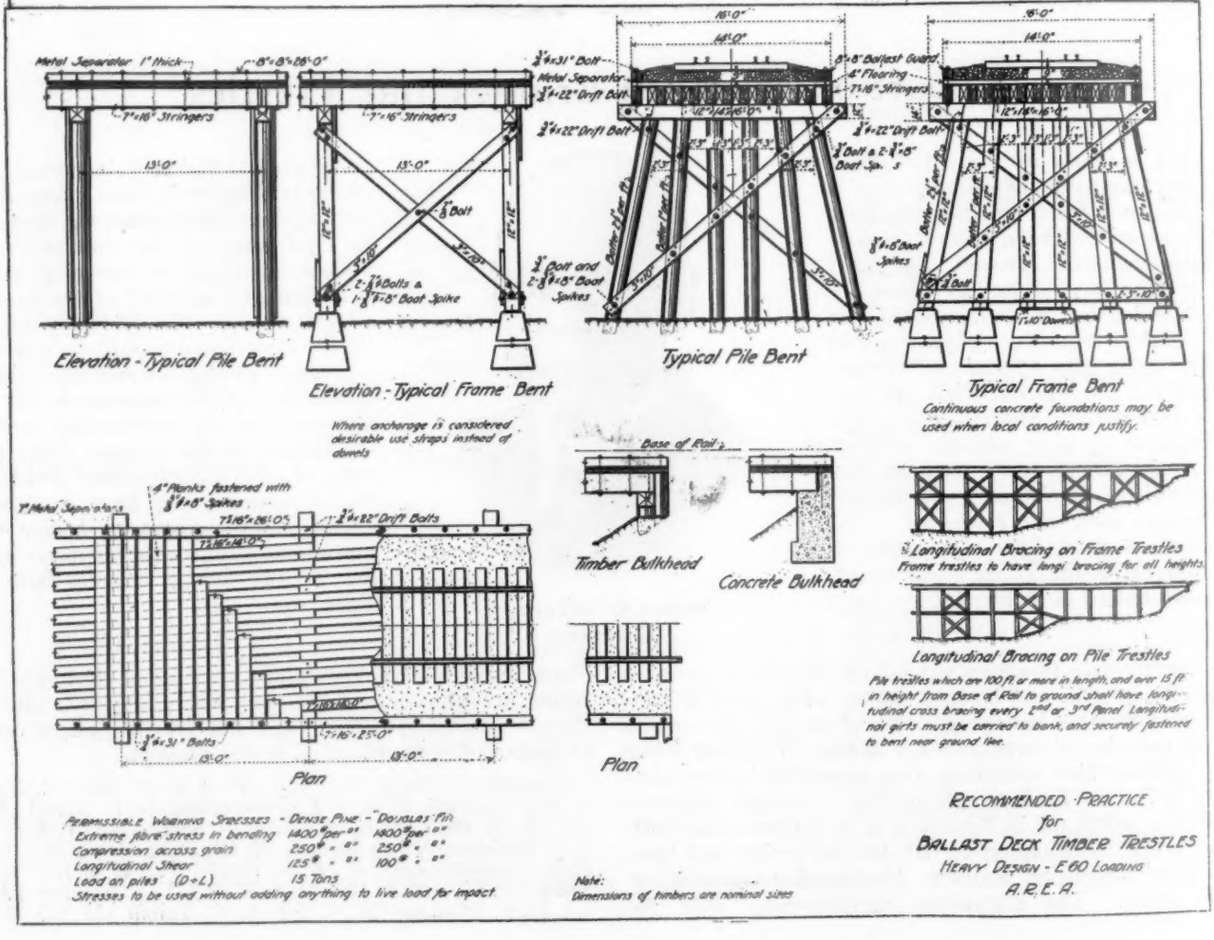
Arthur O. Ridgway
Chairman

Arthur O. Ridgway, assistant chief engineer, Denver & Rio Grande Western, is now completing his first year as chairman of the committee, although he served as vice-chairman in 1919 and as a member of the committee since 1915. Mr. Ridgway has had a wide experience in railway engineering and operative matters, having served in various positions in his earlier years in the engineering corps of the Denver & Rio Grande, chief engineer of the Bellefontaine Bridge & Iron Company, and later as locating engineer, office engineer, bridge engineer and assistant chief engineer of the Rio Grande, having held the latter position since 1909.

A STUDY AND PROGRESS REPORT on the useful strength of new, old and treated timber when used in railway trestles, including a critical examination of the present theories of stresses when applied to timber when under railway load conditions was presented by the committee in Appendix A as information. Another progress report was presented in Appendix B as information, dealing with the classification of the uses of timber and lumber under American Railway Engineering Association specifications. The committee recommended that the plans presented in Appendix C for open deck pile and frame trestles, both light and heavy designs, multiple story trestles and ballast deck pile trestles, heavy design be approved for publication in the Manual.

Committee: Arthur Ridgway (D. & R. G. W.), chairman; H. J. Hansen (C. M. & St. P.), vice-chairman; H. Austill (M. & O.), W. H. Hoyt (D. M. & N.), O. C. Badger (A. T. & S. F.), J. B. Maddock (C. of Ga.), C. H. Blackman (L. & N.), C. E. Paul (Armour Institute), W. E. Hawley (D. M. & N.), D. W. Smith (H. V.), H. T. Hazen (C. N. R.), L. L. Sparrow (A. C. L.), C. S. Heritage (K. C. S.), G. C. Tuthill (M. C.), D. F.


Note:
Spacing of posts similar to spacing in one story trestles
Super-elevation for curves to be framed in posts.
Dimensions of timbers are nominal sizes.
Typical 5 Post Bent
12 ft. & 14 ft. Panel Lengths
Typical 6 Post Bent
16 ft. Panel Lengths
Note: Continuous foundations may be used when local conditions justify
Where anchorage is considered desirable use straps instead of dowels
Note:
Trestles with two or more stories, over 150 ft. long to have longitudinal cross bracing as shown.
Diagram Showing Longitudinal Bracing
Detail at "A"
Detail at "B"
Detail at "C"
RECOMMENDED PRACTICE
for
MULTIPLE STORY TRESTLES
HEAVY DESIGN E 60 LOADING
A.R.E.A.


Elevation - Typical Pile Bent
Elevation - Typical Frame Bent
Typical Pile Bent
Typical Frame Bent
Continuous concrete foundations may be used when local conditions justify.
Where anchorage is considered desirable use straps instead of dowels
Timber Bulkhead
Concrete Bulkhead
Plan
Plan
Longitudinal Bracing on Frame Trestles
Frame trestles to have longi. bracing for all heights
Longitudinal Bracing on Pile Trestles
Pile trestles which are 100 ft. or more in length, and over 15 ft. in height from Base of Rail to ground shall have longitudinal cross bracing every 2nd or 3rd Panel. Longitudinal girts must be carried to bank, and securely fastened to bent near ground line.
PERMISSIBLE WORKING STRESSES - DENSE PINE - "DOUGLAS" FIR
Extreme fibre stress in bending 1400 per cent 1900 per cent
Compression across grain 250 " " 250 " "
Longitudinal Shear 125 " " 100 " "
Load on piles (D+L) 15 Tons
Stresses to be used without adding anything to live load for impact
Note:
Dimensions of timbers are nominal sizes
RECOMMENDED PRACTICE
for
BALLAST DECK TIMBER TRESTLES
HEAVY DESIGN - E 60 LOADING
A.R.E.A.

Holtman (Cons. Engr.), L. S. Wonson (M. P.), C. J. Hogue (West Coast Lumbermen's Assoc.).

Appendix C—Standard Wooden Trestles

The committee submitted plans last year for Open Deck Pile and Frame Trestles, with panel lengths of 12 and 16 ft., for E-45 and E-60 Loading; Multiple Story Trestles, and Ballast Deck Trestles. The convention did not approve the plans for Open Deck Trestles, but did approve those for Multiple Story and Ballast Deck Trestles. This year the committee submitted the following plans:

Open Deck Pile Trestle, Light Design, E-45 Loading, with panels, 12, 14 and 16 ft. long.

Open Deck Pile Trestle, Heavy Design, E-60 Loading, with panels 12, 14 and 16 ft. long.

Open Deck Frame Trestle, Light Design, E-45 Loading, with panels 12, 14 and 16 ft. long.

Open Deck Frame Trestle, Heavy Design, E-60 Loading, with panels 12, 14 and 16 ft. long.

Multiple Story Trestle, E-60 Loading, with panels 12, 14 and 16 ft. long.

Ballast Deck Pile and Frame Trestles, Heavy Design, E-60 Loading.

While the Ballast Deck plans submitted last year were approved, the committee recommended that the following change, as shown in the plans this year, be made in order to insure uniformity in the size of stringers in Open Deck and Ballast Deck. On the plans submitted last year 11 stringers 8 in. by 16 in. were used. The committee now recommends that this be changed to 12 stringers 7 in. by 16 in.

For Multiple Story Trestles the committee recommended the substitution of the plans submitted for those adopted last year, the principal change being an increase in the strength of the connection of the longitudinal diagonal bracing to the posts by using two ⅞-in. bolts and one ⅜-in. boat spike, instead of one ¾-in. bolt and two ⅜-in. boat spikes.

The committee noted the criticisms made at the convention of the plans for Open Deck Trestles, and they also addressed a letter to the chief engineers of 69 of the most important railroads of this country and Canada and invited their criticisms of the plans submitted to the convention if they did not approve same. The committee found that in some cases the criticisms would not harmonize with previously adopted standards of the Association, such as unit stresses, clearance diagram and floor fastenings. Other criticisms were not justified in the committee's judgment by the experience of the majority of the most important railroads of the country. While the committee recognized that the prevailing practice in any feature is not in itself sufficient reason for recommending it, it does feel that in the absence of definite objection based on sound engineering, prevailing practice which has been successfully used for a long period is good reason for adoption.

The principal changes made in the plans of Open Deck Trestles submitted last year are:

Provision for a panel length of 14 ft. as well as 12 and 16 ft.

The adoption of one size of cap, 12 in. by 14 in., for all trestles, pile and frame, the cap being placed flat on pile trestles and on edge on frame trestles.

Strengthening the connection of longitudinal side bracing by the use of two ⅞ inch bolts and one ⅜ inch boat spike instead of one ¾ inch bolt and two ⅜ inch boat spikes.

Addition of plans for bulkheads of wood and of concrete.

In making provision for a panel length of 14 ft. the committee desired to provide for the varying conditions existing in different parts of the country. The 12-ft. panel lengths are desirable in those sections where comparatively level country prevails, where bents are low and economy requires that shorter spans with smaller stringers be used; the 16-ft. panel being most suitable for hilly or mountainous sections where fewer bents are most economical and where large stringers are easily obtained; and the 14-ft. length being a mean between these extremes. In submitting these plans for three panel lengths it was not the expectation that they would be used on the same railroad, as seemed to be the impression of some members, but that a railroad would adopt that length which would suit the particular conditions that existed on its road.

In providing plans for E-60 loading the committee desired to conform with the loading adopted by the association as a minimum for steel bridges, feeling that for loadings that would be materially greater than E-60, other construction than wooden trestles would probably be used. They also felt that plans for a loading lighter than E-60, for use on railroads of light traffic with light rolling stock, should be provided, and yet the lightest design should be adequate for coal, ore, or other cars of great capacity, which are liable to be used anywhere, and therefore selected E-45 loading for the light design. In selecting the size stringers to be used the committee designed so that if it were desired to increase the capacity of a trestle built of light design to a heavy design, this might be done by simply adding one more stringer of same size to the three used in the light design.

The plans are designed for the use of dense southern yellow pine or No. 1 structural douglas fir. If other woods of greater or less strength are used, changes should be made as necessary. The unit stresses used are those found in Volume 22 of "Proceedings," page 542, and which are also shown on the plans.

The effects of such impact as occurs on wooden trestles is provided for in these limiting unit stresses. Reference to the tabular "Comparison of Unit Stresses" for the adopted loadings, panel lengths and various sizes of stringers, accompanying this report, shows that the Extreme Fiber Stresses in bending and the compression in bearing are within 6 per cent of the limiting unit stresses. In longitudinal shear the limiting stress would in some cases when fir is used be exceeded about 20 per cent, but the committee was unanimous in recommending this as being within safe limits.

In preparing the drawings it was not the intention to make them so complete in every detail that they could, without being amplified, be issued to construction forces, as there are many unessential details the practice in regard to which varies with different conditions, and the committee felt that railroads should be at liberty to use their own practice to meet their own particular conditions in unessential features.

In recommending the plans for adoption as Recommended Practice the committee did not undertake to say that they are the best in every respect that can be produced to meet all the varying conditions that may occur in different sections of the country, but with that they conform with good engineering and in all essentials are in accord with the best practice of the leading railroads of the country.

Discussion

(A. O. Ridgway, chairman, presented the report and outlined the work of the committee with respect to the strength of new, old and treated timber, with the assistance of W. E. Hawley (D. M. & N.), pointing to the cooperative efforts on the part of other organizations in this work. Mr. Ridgway also spoke on grading rules for lumber, stating that the national movement for simplification of such rules made it desirable to defer action until this movement is further advanced. J. B. Maddock (C. of Ga.) then presented Appendix C, Standard Wooden Trestles, outlining the procedure which the sub-committee had followed as well as conclusion that it had arrived

at. On presentation of the report, it was accepted by the association without modification after which the committee was excused with the thanks of the association.)

Closing Business of the Association

President Campbell, before retiring from the chair, paid a tribute to C. A. Wilson, consulting engineer, stating that he had not only not missed a meeting of the association since its inauguration, but that he also had been present at the preliminary meeting which started the organization. D. A. Steel (*Railway Age*) offered the following resolution on a railway centennial, which was seconded by H. R. Safford (C. B. & Q.) and approved.

To the American Railway Association:—The American Railway Engineering Association in its twenty-fourth annual convention, assembled at Chicago on this date of March 15, 1923, taking pride from the beginning in the development and achievements of American railroads of which it is a part, noting its problems and looking solicitously to its future welfare, suggests the proximity of the hundredth anniversary of American railroads; expresses the belief that this event will afford an invaluable opportunity for the railroads to quicken the pride of railway men in the substantial and effective method of giving an exhibition of progress in railway transportation; recommends that the railroads should give serious and immediate consideration to the holding of a centennial celebration, national in scope and even perhaps of international interest, representing the combined energies of all American railroads; and declares itself ready and willing to assist and co-operate as may be deemed fit in conducting the necessary investigations and preparations directed to this end.

The new President, Mr. Lee then took the chair and the convention adjourned.

A. R. E. A. Registration

THIRTY-TWO MEMBERS and 23 guests registered at the American Railway Engineering Association convention yesterday, making a total registration for the convention of 665 members and 168 guests, a combined total of 833, as compared with 859 last year. The following registered yesterday:

Members

Blackman, C. H., prin. asst. engr., L. & N., Louisville, Ky.
Clarke, R. N., asst. engr., Mo. Pac., Kansas City, Mo.
Copeland, R. D., asst. engr., Wabash, Moberly, Mo.
Crites, G. S., div. engr. main. of way, B. & O., Baltimore, Md.
Danes, J. E., div. engr., Wabash, Decatur, Ill.
Darrow, F. T., asst. chf. engr., C. B. & Q., Lincoln, Neb.
Duer, J. V. B., elec. engr., Pennsylvania, Altoona, Pa.
Elkins, C. R., asst. supt. transportation, B. & O., Cincinnati, Ohio.
Fatherson, T. W., supt. C. G. W., Clarion, Iowa.
Force, H. J., chemist and engr. of tests, D. L. & W., Scranton, Pa.
Gersbach, Otto, chf. engr., Chicago Junction, Chicago.
Giles, W. H., asst. engr., Mo. Pac., St. Louis Mo.
Graham, F. M., engr. maint. of way, Pennsylvania, Columbus, Ohio.
Haines, W. L. R., asst. engr., Pennsylvania, Pittsburgh, Pa.
Hazen, H. T., chf. engr., Can. Nat., Toronto, Ont., Canada.
Hillman, F. W., div. engr., C. & N. W., Chicago.
Hodgman, B. B., vice-pres. and chf. engr., National Water Main Cleaning Co., New York City.
Huntsman, H. M., div. engr., Wabash, St. Louis, Mo.
Johnson, J. M., cons. engr., I. C., Louisville, Ky.
Lane, E. G., engr. maint. of way, B. & O., Baltimore, Md.
Melton, J. K., official photographer, I. C., Chicago.
Morphy, L. G., chf. engr., Rutland, Rutland, Vt.
Schofield, J., architect, Can. Nat., Toronto, Ont., Canada.
Scribner, C. J., asst. scale engr., C. B. & Q., Chicago.
Sharp, T. F., dist engr., M. K. & T., Greenville, Texas.
Strate, T. H., engr. of track elev., C. M. & St. P., Chicago.
White, H. H., asst. engr., Mo. Pac., St. Louis, Mo.
Wilson, C. A., cons. engr., Cincinnati, Ohio.
Withington, S., elect. engr., N. Y. N. H. & H., New Haven, Conn.
Wonson, S. L., bridge engr., Mo. Pac., St. Louis, Mo.

Guests

Alexander, E. E., supr. of plants, B. & O., Green Spring, W. Va.
Cherrington, F. W., director engrg. and sales, The Jennison-Wright Co., Toledo, Ohio.
Coates, William, Chicago.
Dowdall, E. J., Universal Portland Cement Co., Chicago.
Elder, S. M., B. & O., Baltimore, Md.
Fay, E., supr. signals, Belleville, Ontario.
Hanson, L. J., super. signals, G. T., Montreal, Que.
Huber, R., roadmaster, C. B. & Q., Brookfield Mo.
Killey, R. M., Michigan Wood Preserving Co., Reed City, Mich.
Knox, Merrill B., McGraw-Hill Co., Chicago.
Lichtenwalner, Glen, instrumentman G. T. W., Battle Creek, Mich.
Lipman, M., div. engr., Pennsylvania, Philadelphia, Pa.
Lord, J. B., asst. engr., B. & O., Newark, Ohio.
MacKenzie, D., instrumentman, G. T. W., Battle Creek, Mich.
Rajchel, W., draftsman, G. T., Durand, Mich.
Schultz, P. G., instrumentman, G. T., Durand, Mich.

Registration of Signal Section A. R. A.

THE FOLLOWING registered at the meeting of the Signal section, A. R. A., at the Drake hotel yesterday, bringing the total list of members and guests for the three days to 502:

Representative Members

Fay, E., supr. sig., G. T., Belleville, Ont.
Himes, A. B., asst. engr., B. & O., Baltimore Md.
Prinn, B. H., sig. supr., B. & O., Baltimore, Md.
Stuart, F. C., sig. engr., E. J. & E., Joliet, Ill.

Railroad Affiliated Members

Anderson, Frank L., sig. maint., A. T. & S. F., Winfield, Kan.

Affiliated Members

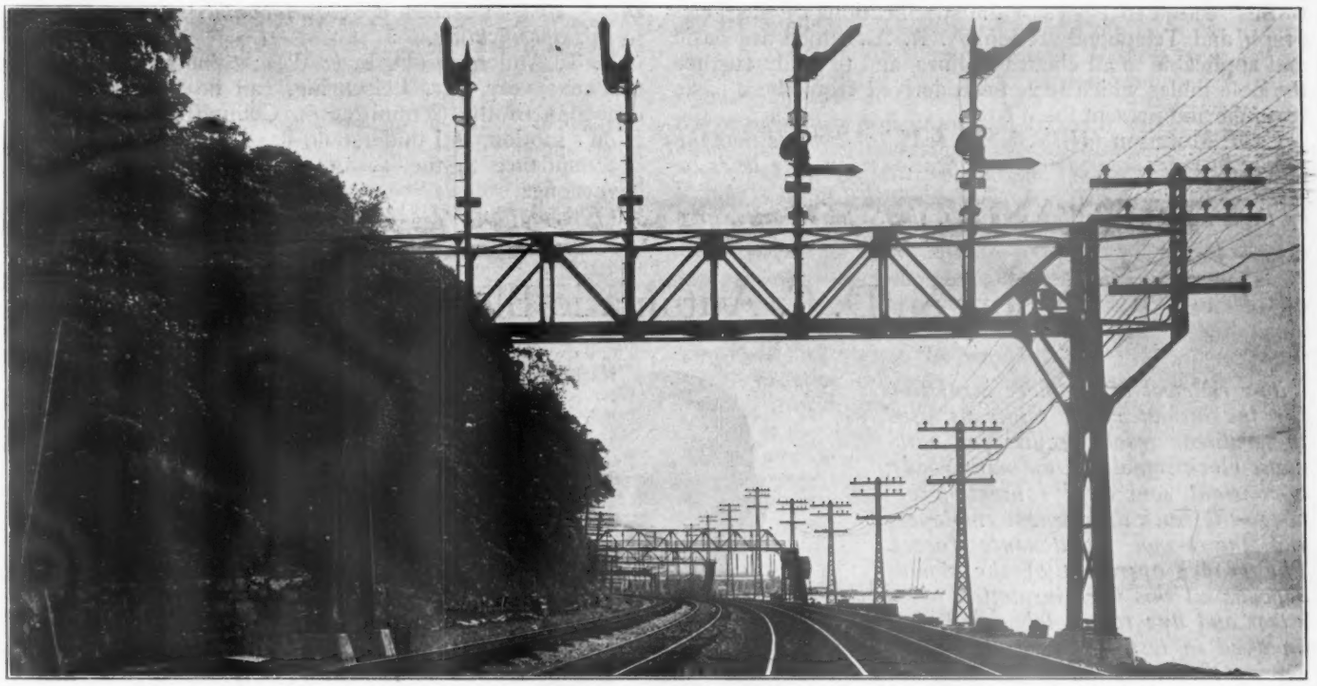
Swallow, Gerald, Diamond State Fibre Co., Bridgeport, Pa.
Woodbridge, J. Lester, chf. engr., Electric Storage Battery Co., Philadelphia, Pa.

Guests

Lasenring, John, sig. & elect. engr., Illinois Traction Co., Springfield, Ill.
Watkins, E. H., salesman, Electric Storage Battery Co., Philadelphia, Pa.

* * *

What a Sliding Embankment Did



Along the Hudson

Third Day's Proceedings of the Signal Section

Changes in Regulations, Final Reports and Election of Officers Featured Closing Session

THE CLOSING SESSION of the Signal section convention at the Drake hotel yesterday was opened by Chairman Christofferson at 9:45 a. m. Action was taken on the four remaining reports. The results of the election of officers were announced and the new officers were inducted into office.

Several important changes in the regulations of the Signal section as proposed by the special committee were adopted. One of the most important of these changes was that no given date is set for the issuance of advance notices of reports but such material is to be in the mails at least 90 days before any regular meeting. This change consists simply of changing from a given date to a given time. With this change it will be unnecessary again to revise the regulations if there should be a desire to change the date of meetings at any future time.

As there was no unfinished business the secretary announced that the next meeting will be held in November, 1923. The announcement of the exact date and the place will be made in the near future.

Report of Committee on Pole Lines

THE COMMITTEE PRESENTED for discussion specifications for the construction and maintenance of wooden pole lines for signal circuits. This report included formulæ for the calculation of pole strengths, with tables of pole sizes, wind pressure areas, etc. A general idea of the scope of the report is given in the introductory set of basic rules as follows:

Basic Rules

For construction or reconstruction the wooden pole lines shall be designed so that the poles shall be of sufficient strength to carry the ultimate number of wires to be located upon them during the life of the poles, under the assumed loading of ice and wind for the territory in which located. Appendix No. 1 indicates the method of calculating the strength of unguyed poles. Appendix No. 2 indicates the minimum dimensions and classes of Chestnut and Eastern White Cedar poles.

The modulus of rupture of the various species of timber used for telegraph and telephone poles is indicated in appendix No. 3. If other than chestnut or eastern white cedar timber is used, the calculation shall be based on the strength of the kind of wood employed.

Appendix No. 4 indicates the method of calculating the strength of a side guy. In allowing for the additional strength obtained by guying, the guyed pole shall be considered as a strut and an arbitrary minimum size of pole may be used for the guyed pole. Special calculations shall be made for special structures or supports, when necessary to secure strength greater than ordinary wooden poles provide.

In the maintenance and renewals of wooden pole lines they shall be maintained so that the poles shall be replaced when the pole circumference is reduced to the figures given in the replacement tables.

Committee: John Leisenring (Ill. Trac.), chairman; C. W. Hixson (Penna.), vice-chairman; G. W. Chappell (N. Y. N. H. & H.), G. H. Dryden (B. & O.), E. G. Stradling (C. I. & L.), G. W. Trout (P. M.).

Discussion

John Leisenring (Ill. Trac.), chairman: The assignment was to prepare specifications for the construction and maintenance of wood pole lines for signal circuits. The work of this committee has been involved with work done by other associations. It was decided to present

to this section that part of the specifications of the Telegraph and Telephone section, A. R. A., which are basic and applicable to all classes of lines, and to study further the pole tables which have been derived from these basic formulæ and present them later.

C. H. Morrison (N. Y. N. H. & H.): *I move that the report in reference to the specifications for pole lines be accepted by the Signal section as submitted or as prepared by the T. and T. section, and that the Signal section give the T. and T. section a vote of confidence in reference to this specification.*

B. T. Anderson (D. L. & W.): The assignment for the next year, Mr. Leisenring, can be handled by the chairman of the Committee on Committees. Mr. Morrison's motion, as I understand it, is simply to give a vote of confidence to the T. and T. section for what they have done.

(The motion presented by Mr. Morrison was carried.)

Report on D. C. Automatic Block Signaling

The renewal of the fibre insulation for the insulated rail joints as used to terminate track circuits for automatic block signals, is, on many roads, a constant source of contention between the track department employees and the signal maintenance forces. The proper operation of the signals depends on this fibre insulation being intact and due to the labor and time involved in testing the joint and renewing the insulation it is highly important that fibre giving a long life be used. Considering the importance of this material the committee has done well to bring this specification up to date and eliminate some of the non-essential requirements of the former specifications and at the same time insert items of vital interest to the railroads. The mechanical tests in the new specifications are more practicable and the new electrical test gives a more satisfactory result. The raw materials to be used by the manufacturer were omitted, however, considerable emphasis was laid on the matter of exact dimensions and fit of the parts and bushings. One new requirement of importance was that a waterproofing substance shall be applied to the fibre. The entire specification is more practical than former specifications. C. F. Stoltz, signal engineer of the C. C. C. & St. L., has been chairman four years.

C. F. Stoltz
Chairman

THE COMMITTEE SUBMITTED revised specifications for hard fibre designated as A. R. A. Signal section Specification 1323.

Hard Fibre

1. Purpose. (a) This material is to be used in railroad track joints, switch rods, etc., for track circuit insulation.

2. Tests. (a) Tests to determine conformity to the following requirements shall be made at the place of manufacture. The manufacturer must provide all apparatus and such assistance as may be necessary for making the required tests under the supervision of the purchaser or his representative.

3. Samples for tests. (a) Three samples shall be selected at random by the purchaser or his representative from each lot or part thereof of 25 sheets of the same specified thickness, or 500 fabricated pieces of the same specified thickness. Test pieces of the required size shall be sawed from each sample selected and shall be free from burrs. If any of the samples fail to meet the requirements of any of the specified tests, the tests shall be repeated on two additional samples selected at random from different pieces of the same lot. Failure of one or both of these samples to meet the requirements of the tests will be sufficient cause for rejection of the lot.

4. Electrical test. (a) Using a voltmeter connected in series with pinpoint electrodes, the points of the latter being spaced not to exceed ⅛ in. apart, and firmly pressed against the common face of the fibre, after the surface skin has been scraped from the contact surface of the fibre, there shall be no deflection of the voltmeter needle with an application of 220 volts.

5. Specific gravity. (a) Fibre shall have a specific gravity of not less than 1.3.

6. Compression test. (a) A standard testing machine shall be used and the load applied through a metal tup ½ in. by ½ in. with corners rounded to 1/64 in. radius, arranged in such manner as to insure an equal bearing of the test sample over the entire surface of the tup. A test piece 1 in. by 1 in. by the thickness shall be placed under an initial load of 100 lb. and the zero reading taken. A load of 5,000 lb. shall then be applied. The depth of depression shall be measured by the mean reading of two suitable measuring and indicating appliances mounted on the upper crushing head of machine, the samples being supported on the lower crushing head, and shall not exceed the following:

	Specified Thickness	Mean Depression
1.	⅛ in.	.024 in.
2.	3/16 in.	.030 in.
3.	¼ in.	.038 in.
4.	⅜ in.	.052 in.

(b) Bushings shall not be subject to the compression test.

7. Absorption test. (a) A test piece 1 in. by 1 in. by the thickness shall be weighed and placed in water at room temperature. It shall be removed from the water at the expiration of 6 hr., the excess moisture wiped off and the test piece weighed immediately. The increase in weight shall not exceed .67 grams.

8. Allowable variation in sizes. (a) Sheets and fabricated parts, except as noted below, shall be within the following tolerances of thickness:

	Specified Thickness	Maximum Thickness	Minimum Thickness
1.	⅛ in. (.125)	.135 in.	.113 in.
2.	3/16 in. (.187)	.197 in.	.170 in.
3.	¼ in. (.250)	.270 in.	.230 in.
4.	⅜ in. (.375)	.395 in.	.355 in.

(b) Head pieces and base pieces for use in insulated rail joints, each bar of which has three bearing surfaces, shall be within the following tolerances of thickness:

	Specified Thickness	Maximum Thickness	Minimum Thickness
1.	⅛ in. (.125)	.133 in.	.123 in.
2.	3/16 in. (.187)	.195 in.	.185 in.

(c) Bushings or ferrules shall not vary either way more .0075 in. on inside diameter nor more than .0075 in. on outside diameter, allowing maximum variation in thickness of wall of .015 in. Maximum variation in length of bushings or ferrules shall be 1/32 in.

(d) End posts shall not, in contour, exceed the contour of the proper rail section at any point, but may come within the rail section contour by not more than 1/32 in. At the option of the purchaser, the height of the head may be decreased by ⅛ in. to meet worn rail conditions.

9.—Workmanship. (a) All surfaces, where cut, shall be substantially free from burrs, fins, splits and other defects.

10. Waterproofing. (a) An approved waterproofing substance shall be applied to the material after it has been accepted by the inspector.

11. Marking. (a) Each piece shall be clearly marked with the manufacturer's name or trade mark.

12. Shipping. (a) Fibre pieces shall be packed in such a manner that they will be protected from the weather and mechanical injury during shipment. Each package shall be plainly marked showing contents, name of manufacturer, name of the consignee, and order number under which furnished.

13. Report. (a) Where desired by the purchaser, a report shall be made in triplicate on the approved form by the purchaser or his representative, giving a record of the tests of the samples taken from each lot, the original and one copy of the report for the purchaser's record, and the other copy for the manufacturer's record.

The committee recommended the acceptance of the report for submission to letter ballot as revised for inclusion in the Manual, to supersede existing subject-matter.

Committee: C. F. Stoltz (C. C. C. & St. L.), chairman; R. E. Green (M. C.), vice-chairman; T. A. Jones (P. R. R.), vice-chairman; H. E. Arnold (L. V.), R. B. Arnold (C. & N. W.), F. H. Bagley (L. & N.), M. A. Baird (Erie), E. E. Bradley (W. M.), J. H. Butridge (I. C.), G. W. Chappell (N. Y. N. H. & H.), W. A. Dawson (N. Y. C.), G. H. Dryden (B. & O.), T. C. Hansen (N P.), C. E. Hartvig (C. R. I. & P.), A. Reilly (D. L. & W.), C. W. Soper (L. I.), R. S. Turner (U. P.), E. P. Weatherby (T. & P.).

Discussion

L. F. Howard (U. S. & S. Co.): I would like to ask the chairman of the committee why it is that the increase in weight is specified irrespective of the edges.

C. F. Stoltz (C. C. C. & St. L.), chairman: Strange as it may seem, the increase in weight varies almost directly with the surface and not with the area exposed. Experiments were made with samples of which the surfaces were waterproofed and the increase in weight taken on the absorption of the edges only. Other tests were made with the edges waterproofed and the increase in weight taken on the absorption of the surface only. It is found that for all practical purposes the surface may govern.

(*The specification was accepted for letter ballot for inclusion in the Manual to supersede existing matter on this subject.*)

Mr. Stoltz: *I move that the form "Report of Test of Hard Fiber" be accepted for letter ballot.* (*Motion carried.*)

Report of Committee on D. C. Relays

On account of the fact that various signal control and electric locking circuits are carried through the contacts of tower indicators it is as important that such apparatus shall be as reliable as any signal relay. Heretofore, the specifications for d. c. relays have been used in a general way for d. c. indicators, however, in addition to the electrical requirements there are many details concerning the mounting, the cover, and the general construction of an indicator that are not covered in any relay specification. The new standardization of the overall dimensions of the indicator will simplify the design of boards and cupboards for mounting the instruments. Therefore, this new specification, including not only the electrical requirements but also mechanical details should benefit both the manufacturers and the railroads. C. D. Cronk, assistant signal engineer of the New York Central, Lines West, is completing his first year as chairman of this committee. Mr. Cronk joined the Railway Signal Association 16 years ago. He served as vice-chairman of Committee VII for five years, starting in 1918 and was an active member of the committee for several years previous. Mr. Cronk was promoted to his present position from assistant engineer with headquarters in the signal engineer's office at Albany, N. Y. in June, 1916.

C. D. Cronk
Chairman

THE COMMITTEE PRESENTED specification for and requisite sheets for direct current indicators, with the recommendation that the report be accepted for submission to letter ballot.

Specification for D. C. Indicators

1. Purpose.—(a) The purpose of this specification is to provide apparatus to indicate visually the approach of a train; the occupancy of a section of track; the repeating of the functioning of a signal or other apparatus.

2. Tender.—(Standard Section).

3. Alternate Requisites.—(a) Alternate requisite section 13123 forms a part hereof.

4. Material and Workmanship.—(Standard Section).

5. Design.—(a) Indicators shall be of a design approved by the purchaser to give indication by either semaphore, disc or light.

(b) Semaphore or disc indicators shall be of the position type operated by the armature.

(c) Unless otherwise specified, indicators shall be furnished without contacts.

(d) Light indicators shall be of the color or position type, in accordance with purchaser's drawing No. ....

(e) When semaphore indications are required, operation of the semaphore shall be 45 degrees in the upper quadrant. When disc indications are required, operation of the disc shall be 90 degrees in the upper quadrant.

(f) Like parts of the same manufacturers' apparatus shall be interchangeable.

(g) Unless otherwise specified, indicators shall be provided with cover, which, when removed, shall permit access to all parts. Covers shall be securely held in place and provided with means for locking.

(h) Unless otherwise specified, the background of the semaphore or disc type indicator shall be painted aluminum.

(i) Wire entrances shall be provided in such a manner that the wires shall not interfere with the proper operation of movable parts.

(j) Indicators shall be so constructed that the several parts may be readily removed and replaced.

(k) Indicators shall be furnished complete for mounting on wall, shelf or post.

(l) All nuts and screws shall be securely locked.

(m) Unless otherwise specified, the outside dimensions of the indicator with cover in place shall not exceed the following: height, 10 in.; length, 8 in.; width, 8 in.

(n) The cover shall be so fixed that sufficient clearance exists between it and all moving parts.

6. Mounting.—(a) The cores and armature supports shall be mounted so that the position of cores relative to each other, to the armature supports and to the fixed part of the operating mechanism shall be maintained.

7. Binding Posts.—(a) Binding Posts shall be so constructed that they cannot be turned in the base or frame to which they are fastened. Binding posts shall be 14-24, and threaded parts, nuts and washers shall be in accordance with R. S. A. drawing 1070.

(b) Binding posts shall be spaced not less than 1 in. centers.

8. Armature Supports.—(a) The end play of the armature shall be not less than .010 in. and not more than .020 in.

(b) Trunnions and bearings for armature shall fit rigidly in their supports and be suitably secured and so constructed that they can not exert pressure on the armature.

(c) Armature trunnions shall be hard-drawn phosphor bronze. They shall be cylindrical, not less than 1/16 in. in diameter and 3/32 in. long.

(d) The armature bearings shall be of different material than the trunnion, either hard brass or nickel-silver, not less than 18 per cent nickel, or of material equivalent in wearing and non-corrosive qualities. They shall be cylindrical, not less than 1/8 in. long and not less than .002 in. nor more than .004 in. larger in diameter than the trunnion.

9. Air Gap.—(a) Unless otherwise specified, a minimum working magnetic air gap of .020 in. shall be maintained by an adjustable hard-drawn phosphor bronze stop pin so placed that its position relative to the cores shall be fixed and so that when the armature is picked up it will strike against the stop near the edge farthest from the bearings and midway between the cores. The physical working air gap shall be not less than .018 in.

(b) A non-adjustable stop pin of phospher bronze shall be placed under each core near the edge farthest from the bearing protruding .010 in. from the underside of the core or the upper side of the armature for safety purposes.

10. Coils.—(a) Coils shall be so made that they may be removed and replaced without changing the magnetic and mechanical adjustment of the indicator. When in place the coils shall be fixed to prevent their movement by vibration with respect to the cores.

(b) Coils shall be so insulated that they will withstand the insulation test provided in Section 19. This test shall be made by mounting coil on a snugly fit metal mandrel and making break-down test between mandrel and winding; also by standing the coil on each end in turn on a metal plate and testing between plate and winding.

(c) Wire for coils shall be soft drawn copper, covered with good quality silk or cotton insulation, or with equally good insulation.

(d) Coils shall be impregnated or otherwise treated so as to satisfactorily protect the wire from moisture under all service conditions. Impregnation shall be in accordance with R. S. A. specification for "Impregnation Treatment of Coils and Windings."

(e) Insulating material used for fillers in winding coils shall be chemically neutral.

(f) Connecting terminals of coils shall be joined together by a 10-30 binding post, A. R. A. drawing 1070. Terminal leads of coils shall be of strands of tinned copper not larger than No. 28 A. W. G. wire. The aggregate cross-section of the strands shall at least equal that of a No. 18 A. W. G. wire. Leads shall be so insulated that they will withstand the insulation test provided in Section No. 19.

(g) Coils shall be protected in a suitable manner from mechanical injury.

(h) At 20 degrees C. (68 degrees F.) the percentage variation in the resistance of individual coils shall not exceed: For 5 ohms, or less, plus or minus, 5 per cent; above 5 ohms, plus or minus, 10 per cent.

(i) Each coil shall be plainly and permanently marked, showing the nominal resistance, number of turns, size of wire and kind of wire insulation on a tag located under the outside lead.

(j) All coils must be full wound and the turns must not be permitted to vary more than 5 per cent, plus or minus, for any given coil. If a resistance above 5 ohms is specified which can not be obtained with standard A. W. G. wire, using full wound coils, the manufacturer may furnish the nearest resistance to this value using full wound coils with standard A. W. G. wire.

11. Operating Mechanism.—(a) The indicator shall be so constructed that the weight of the indicating element shall assist the armature to return to the de-energized position.

12. Outdoor Indicator, Supports and Guards.—(a) Outdoor indicators shall be weatherproof and of a type approved by the purchaser.

(b) Unless otherwise specified, supports and guards for outdoor indicators shall be furnished.

13. Magnetic Iron Test.—(a) Purchaser may use any means he desires to satisfy himself the proper grade of iron has been used in the magnet circuit.

14. Operating Characteristics.—(a) Unless otherwise specified, the minimum dropaway value of indicators shall be not less than:

	volts	current
500-ohm indicators	....	....
1000-ohm indicators	....	....

(b) Unless otherwise specified, the maximum direct pickup value of indicators shall be as follows:

	volts	current
500-ohm indicators	....	....
1000-ohm indicators	....	....

(c) Tests shall be made on indicators that are assembled ready for service.

(d) Unless otherwise specified, an initial charge of 10 volts shall be applied to the coils and then reduced until the armature drops away. This value shall be the dropaway value of the indicator.

(e) The circuit shall then be broken and current shall again be applied to the coils and increased until the armature is picked up. This value shall be the maximum pickup.

(f) The current shall then be increased until the armature is against the stop. This value of the current shall be the working current.

15. Finish.—(a) Metal Parts shall be protected against corrosion, except when such protection will interfere with the proper operation of the indicator.

(b) Material used for protection against corrosion shall neither melt nor flake under ordinary conditions between temperatures between 40 degrees C. (40 degrees F.) below zero, and 85 degrees C. (185 degrees F.) above zero.

16. Identification.—(a) The following data shall be given, visible with the indicator in its operating position but not shown on the indicator cover: 1. Manufacturer's name; 2. Serial number; 3. Resistance of coils; 4. Operating characteristics; 5. Date tested; 6. Identification of tester.

(17. Dielectric Requirements is a General Electrical Requirements section; 18, Inspection; 19, Tests; 20, Packing; 21, Marking and 22, Warranty, are standard sections.)

Committee: C. D. Cronk (N. Y. C.), chairman; E. T. Ambach (B. & O.), vice-chairman; C. M. Acker (D. & H.), B. H. Ayers (L. & N.), G. H. Caley (N. Y. O. & W.), J. J. Corcoran (N. Y. C.), E. E. Ireland (C. I. & L.), A. J. Kelly (C. C. C. & St. L.), H. W. Lewis (L. V.), H. C. Price (Erie), C. F. Smith (St. L. & S. F.), J. E. Steward (Penna.), L. C. Walters (Sou.), W. B. Weatherbee (D. L. & W.), E. G. Wesson (C. B. & Q.).

Discussion

R. B. Elsworth (N. Y. C.): Are we all clear on Section 1—Purpose? It would seem to me this would be clearer if we say, "The purpose of this specification is to provide the repeating of the functioning of this signal," but when you insert the words "the purpose of the specification is to provide apparatus to indicate visually the repeating of the function of the signal," I don't think it is clear.

C. D. Cronk (N. Y. C.), chairman: The committee would suggest that the paragraph read, "The purpose of this specification is to provide apparatus to indicate visually the approach of a train; the occupancy of a section of track, or the functioning of a signal or other apparatus."

In Section 5—Design, paragraph (m), the committee wishes to make a correction in the height of indicator. This should read 13 in. instead of 10 in. The width is changed from 8 in. to 8 ½ in.

The committee wishes to fill in the blank spaces in the form under Section 14—Operating Characteristics, and change the heading of "Current" to "Amperes." For the 500-ohm indicators the voltage should be 2.5 volts and the amperes .005. For the 1,000-ohm indicators the voltage should be 2 volts and the amperes .004. In paragraph (b) change the heading "current" to "ampere" and fill in the blank spaces. For the 500-ohm indicator the voltage is 6.5 volts, and the amperes .013. For the 1,000-ohm indicator the voltage is 7.5 volts and the amperes .015.

The action recommended is acceptance for submission to letter ballot as revised, for inclusion in the Manual. Just before closing, I would like to go back to Section 14 and reverse the figures under volts for the 500-ohm and 1,000-ohm indicators.

F. B. Wiegand (N. Y. C.): *I move that the report be accepted for submission to letter ballot for inclusion in the Manual.* (*Motion carried.*)

Report of Committee on D. C. Track Circuits

The fundamental feature of the automatic signal is the track circuit, the operation of which depends on the train shunting across the rails to release the track relay. The fact that, on some occasions on sidings or crossovers infrequently used, the circuit has not been shunted properly, has led this committee to give this matter exhaustive study and to make numerous field tests. The committee presented a set of instructions for testing the resistance of train shunts together with a typical form for recording the test readings made. Connected with the closed point of all main line switches in automatic block signal territory, is a circuit controller so connected electrically as to shunt the track circuit if the switch is left in the wrong position or in case the switch point is held away from the stock rail by any foreign substance. The testing of these shunt circuits is highly important, therefore the committee presented a set of instructions for proper tests. Although this report involved very important tests, it was prepared in a manner that should be understood readily by signal maintainers and inspectors. Therefore railroads will find extensive practical use for this information. A. R. Fugina, signal engineer of the Louisville & Nashville, has been chairman of the Committee on Track Circuits for the last three years.

A. R. Fugina
Chairman

THE COMMITTEE PRESENTED, (1) Instructions for testing train shunts. (2) Instructions for testing resistance of switch circuit controller shunt circuits and contacts, and (3) Tentative values for train shunt resistance and switch circuit controller contact resistance.

Instructions for Testing Resistance of Train Shunts

1. It is important that meters be accurate.
2. It is recommended that range of ammeter be 0-15 amp.
3. It is recommended that range of voltmeter be 0-.15 volt and 0-1.5 volts.
4. The same meter scales should be used for normal and reverse readings.
5. Current and voltage readings should be taken simultaneously and results recorded on prescribed form.
6. After relay and battery leads have been disconnected and test set leads connected to the rails at the point where the test is to be made, the normal and reverse readings should be taken with the track circuit unoccupied, to determine the leakage resistance of the circuit under test, and the average results recorded.
7. The track section on which tests are being made should not be shunted other than by the equipment being tested.
8. When testing the resistance of standing equipment, it should be located at the point where the test set is connected to the rails.
9. When testing the resistance of moving equipment, the test should be made while the equipment is passing the point where the test set is connected to the rails.
10. It is desirable to obtain records of tests made under various rail and wheel surface conditions, such as infrequently used turnouts with rusty rails and equipment with rusty wheel surfaces, also on the main tracks with bright rails and equipment with bright wheel surfaces.
11. To test train shunt resistance on fouling circuits of turnouts on crossovers, use the same set up and make tests in the same manner as described above.

Instructions for Testing Resistance of Switch Circuit Controller Shunting Circuits and Contacts

1. It is important that meters be accurate.
2. It is recommended that range of ammeter be 0-15 amp.
3. It is recommended that range of voltmeter be 0-15 volts and 0-1.5 volts.
4. Current and voltage readings should be taken simultaneously and the results recorded on the prescribed form.
5. Readings are to be taken after the contact has been closed by operating the controller lever, without any change in the service conditions of the contacts.
6. To test single contact or contacts in multiple, disconnect the wire from one rail to the binding post.
7. The total resistance of the ammeter leads is to be approximately one-tenth ohm.
8. Use the same meter scales for tests on various controllers.
9. Contact numbers start from the left side of the controller when facing the terminal board.
10. Track numbers start from south to east main track.
11. Controllers are to be numbered, starting at the first switch from the signal protecting movements over the track in which the switch is located. The number of the controller on the side track end of the crossover switch is to be prefixed with "X".

Tentative Values for Train Shunt Resistance and Switch Circuit Controller Contact Resistance

Train Shunt Resistance on Main Tracks.—From data thus far obtained it appears that on main tracks where the rail and wheel surfaces are reasonably bright, the train shunt resistance is not greater than .04 ohm.

This value is arrived at from tests the committee has made and is based on the actual resistance made with one pair of wheels with dull wheel contact surface of an empty car pushed onto a track circuit with dull rail surfaces, and applies to train shunt resistance on main tracks where the wheel and rail surfaces are not more adverse than the conditions mentioned above and does not include fouling sections of lead switches, crossovers or tunnel sections.

Train Shunt Resistance on Fouling Sections and Crossovers.—From tests made this value is found to be so variable that it seems a fixed maximum value that may be obtained can not be determined, due to the varying conditions of rail and wheel surfaces.

When the value does not exceed 1.5 ohms the conditions can probably be handled by the use of a separate track circuit with a 12 or 16-ohm track relay, 2-volt battery and high limiting resistances, or on fouling sections of lead switches having switch-connected or lifting type derails at the end of the fouling sections, the track circuit may be shunted when the derail is in the non-derailing position, provided no part of the car is allowed to stand on the fouling section when the derail is in the derailing position.

Switch Box Circuit Controller Contact Resistance.—The total resistance of closed shunting contacts of switch circuit controllers and their wire connections to the rail should not exceed the train shunt resistance value determined for the track shunted.

In connection with Mr. Thorrowgood's report on high train shunt conditions obtained on English roads, the New York Central, Lines West, has installed four crossover circuits at places where difficulty was experienced in the shunting of relays due to coal dust. The crossover circuits are in good condition, ballast free from rails, wet ballast resistance not less than 25 ohms, dry 85 to 90 ohms. A 6-volt storage battery is used with 75-ohm limiting resistance and 11-ohm relay. With this arrangement a train shunt of 4 ohms will drop the relay.

The committee recommended that these instructions be accepted as information.

Committee: A. R. Fugina (L. & N.), chairman; R. M. Phinney (C. & N. W.), vice-chairman; H. H. Appleton (P. R. R.), Dwight Byers (N. Y. C.), E. B. DeMeritt (C. of Ga.), R. E. Green (M. C.), A. M. Gilbert (C. C. C. & St. L.), H. G. Morgan (I. C.), A. H. McKeen (U. P.), G. A. Morty (B. & O.), D. S. Rice (L. V.), K. W. Spain (R. I.), J. B. Weigel (L. & N.), L. S. Werthmuller (Mo. Pac.), A. J. Yarrell (C. I. & L.).

Discussion

W. M. Post (Penna.): Paragraph (1) allows for no variation in the accuracy of meters.

J. S. Gensheimer (Penna.): In the specifications for the portable volt-ammeter the accuracy is within one-

half of one per cent and for certain types one-quarter of one per cent.

A. R. Fugina (L. & N.): The committee will consider that. In the form for recording tests it was suggested that only one column be shown for contacts, with a note for any additional information that is desired. It is the intention of the committee to provide that.

Mr. Fugina: The values for train shunt resistance and switch circuit controller contact resistance are tentative only. These are not our final values.

F. W. Pfleging (U. P.): We have used 16-ohm relays for cross-over circuits, with good results, for years.

(*The report of the committee was accepted as information.*)

The Signal Section Elects New Officers

Results of the Annual Election Announced Yesterday; Sketch of Chairman-Elect B. T. Anderson

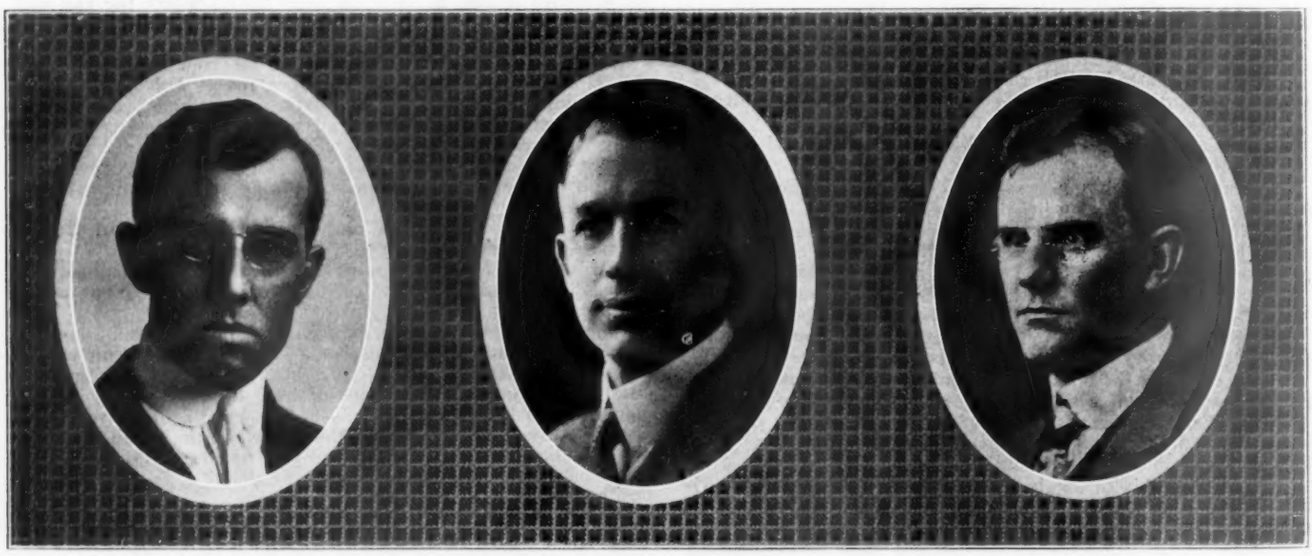
AT THE CLOSE of the session yesterday morning Chairman Christofferson announced the results of the election of officers of the Signal section for the ensuing year, as follows:

Chairman—B. T. Anderson, assistant signal engineer, Delaware, Lackawanna & Western, Hoboken, N. J.

First Vice-Chairman—W. M. Vandersluis, electrical engineer, Chicago Terminal Improvement, Illinois Central, Chicago.

Second Vice-Chairman—W. M. Post, superintendent telegraph and signals, Pennsylvania System, Pittsburgh, Pa.

Secretary—H. S. Balliet, assistant terminal manager, Grand Central Terminal, New York.



W. M. Vandersluis
First Vice-Chairman

B. T. Anderson
Chairman

W. M. Post
Second Vice-Chairman

Burt T. Anderson, Chairman, Signal Section, A.R.A.

B. T. Anderson is the sixth chairman of the Signal section since it became a part of the American Railway Association and the twenty-fifth man to head the association since the organization of the old Railway Signaling Club in 1895. Mr. Anderson is one of the younger members of the association, having been active in association work from the time of his connection with the organization. After graduating in electrical engineering at the University of Illinois in 1907, he entered the apprenticeship course of the Union Switch & Signal Company and was engaged for some time in the installation of automatic signals on the Lake Shore & Michigan Southern and in alternating current signal construction work on the Hudson & Manhattan and on the Pennsylvania Terminal at New York City. About half of his three years' apprenticeship course with the Union Switch & Signal Company was spent in the electrical, mechanical and alternating current departments at Swissvale, Pa. On June 1, 1910, he left this company to go with the Atchison, Topeka & Santa Fe as signal draftsman. On October 1 of that year he was appointed construction foreman on alternating current installations at Barstow, Calif. It was shortly after he arrived on this job that an incident took place which illustrates his ability to overcome hardships and accomplish results. Mr. Anderson had been married about a month or so before being assigned to this construction work and on arriving at Barstow found that there were no living accommodations. He requisitioned the use of a box car, which he and his wife fitted out attractively with college pennants, tennis rackets and other college paraphernalia. This came to be known up and down the line as 12968 Santa Fe avenue, Barstow. Many recall with pleasure the hospitality extended at the above address. On March 15, 1913, he was appointed assistant signal engineer of the Atchison, Topeka & Santa Fe and stayed with the Santa Fe until June 15, 1914, when he became assistant signal engineer of the Delaware, Lackawanna & Western with headquarters at Hoboken, N. J.

Since 1913, Mr. Anderson has been prominently iden-

tified with alternating current signaling. In 1913 he served on Committee III—Power Interlocking, and in 1914 he was vice-chairman of Committee VIII—Alternating Current Automatic Signaling, and that same year served as alternate delegate for the Railway Signal Association on the National Joint Committee on Overhead and Underground Line Construction. From 1915 to 1923 Mr. Anderson has served as a member of Committee VIII. In 1920 he was a member of the Nominating committee and in 1921 was elected second vice-chairman of the Signal section. In 1922 he was elected first vice-chairman, automatically becoming chairman of the Committee on Committees of the Signal section; in addition he was made chairman of Committee XIX—Economics of Railway Signaling, and also served as a member on Committee IX—Wires and Cables. In 1922 he was the Signal section conferee on the American Engineering Standards Committee on "Wires and Cables" on Committee 3—Stranding, of this committee. Mr. Anderson is also an associate member of the American Institute of Electrical Engineers.

Realizing the importance of determining the savings made by the use of signals in railroad operation, Mr. Anderson has been an earnest and hard worker in developing this important information. He feels that through the development of such data the Signal section will be in a position better to serve the railroads to advantage and to make the signal department one of the most important departments on any system. Mr. Anderson brings to the position of chairman enthusiasm and energy and this, coupled with the fact that he is a hard worker, will do much to further the interests of the Signal section and of the railroads in general.

An Electric Lantern with New Features

THE BAIL SWITCH AND THE special lense with a spotlight in the bottom, are the noticeable features of the new electric trainmen's lantern recently placed on the market by the E. B. Bronson & Co., Blue Island, Ill. By bringing the bail all the way down on one side the light is switched on and locked; by bringing the bail all the way down on the other side the light is switched off and locked. Illumination may also be secured by means of a hand-snap switch. The easy grip bail ½ in. diameter, of either wood or metal, is a new feature. The bail can be extended on the trunnion so as to be adjustable to fit the arm of the man using the lantern.

A special nitrogen, single contact, bayonet base, lamp-bulb is used in these new lanterns, by means of which it is claimed that fixed adjustment is secured and loose contacts eliminated. A clamp is furnished under the top cover in which two extra bulbs may be carried.

The lens of the trainsmen's lantern is 1½ in. in diameter and is securely fastened over and around the bulb, extending below the battery compartment. This lens may be furnished in crystal, ruby, blue, green or amber color. With the crystal white lens, a special little lens is formed in the bottom of the large lens, whereby a spotlight may be directed for the illumination of a car coupler, a step, etc.

In contrast to the trainmen's lantern the inspector's lantern is designed for the use of car inspectors, watchmen, locomotive inspection, etc. The battery compartment is pivoted on the lantern base as shown and may be turned to any angle so as to direct illumination on the work. This lantern is equipped with a large, clear glass lens screwed on, in place of the small colored lens or the brakemen's lantern.

A new feature of these lanterns is the multiple cell battery adapter. This adapter holds four standard No. 9 dry cells and the coupler unit fits in the battery compartment.

Cell Adapter

Trainman's Lantern

All Purpose Lantern

Two cells may be used at one time and after these have been used for some time the circuit can be switched to the two other cells; then after considerable service all four cells can be switched onto the circuit. By this means the dry cells are exhausted to full life limit.

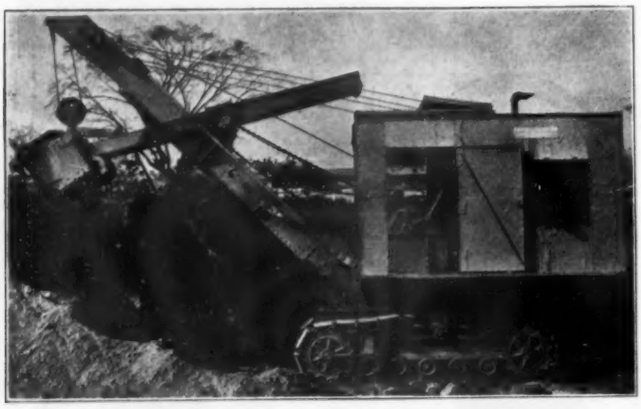
A Tractor Gasoline Shovel of One Yard Capacity

THAT THE ADPTATION of gasoline power and crawler traction to steam shovel operations has by no means been found impracticable, is suggested by the recent action taken by the Pawling & Harnischfeger Company, Milwaukee, Wis., in developing a machine of this kind having a capacity of one yard. Heretofore this company has confined this class of power to machines having only three-quarter yards capacity. The success of the smaller machines, however, together with the development that has been made in gasoline power for this purpose, has evidently induced the manufacturers to believe that the larger capacity shovel will find as large a field for use and be as serviceable as the smaller shovels. The principal field for such equipment, of course, arises where the cost of operation favors the use of an internal combustion engine and where the work is less handy to a track shovel than to a machine capable of operating without the use of track.

The new shovel is similar to the company's three-quarter-yard machine, having the same crowding motion, a similar form of tractor mounting and also being convertible for operating a drag line in clam shell, driving piles or crane work. In this machine the pinion on the shipper shaft is driven by a heavy steel chain from a set of planet gears mounted in the forward drum of the

machine. This mechanism affords a means of shaking the dipper rapidly, as is desirable when operating in clay or gumbo.

The principal feature of the new machine of interest in railway service is the claim that it is the largest type of machine that can be loaded upon the standard flat car without major dismantling, this feature thus readily permitting shipment from place to place. The machine is one-man operated, has two pairs of driving and idle sockets in the mounting with corduroys that are represented to be non-cloggable, and all gears have cut teeth. As the illustration shows, the machinery is enclosed in steel housing.



The New One-Yard P. & H. Excavator

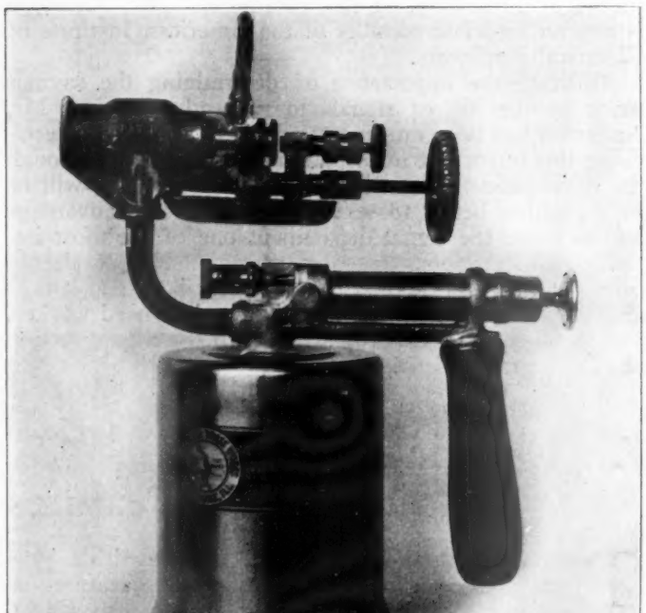
Two of the machines are now in use in construction work on one of the Southwestern roads.

A New Line of Hand Blow Torches

THE FACT THAT THE blow torch maintains an intensive flame in close proximity with highly inflammable oil under pressure and that the workmen using them are not always careful, lend interest to several features of a line of blow torches only recently placed on the market. Probably the chief distinguishing feature of the torch is the presence of a safety valve which is located at the end of the horizontal pump cylinder and serves the dual purpose of releasing the pressure automatically when about double the normal pressure required for operating the torches is present, and also permitting a manual release of the air pressure after the work is done. Another feature said to be exclusive of this torch is the one opening into the tank. This opening is at the top above the fuel line and is sealed by the screw thread filler plug. The elimination of soldered connections at the burner inlet and upper and lower pump brackets removes a frequent cause of trouble arising from leakage.

Another interesting feature is the construction of the torch head, which contains a baffle so placed in the path of the flame as to vaporize the fuel into a hot, dry and highly inflammable gas. The effectiveness of this construction is said to be such that the torches can burn kerosene or the leanest grade of gasoline and to generate a flame as much as 400 deg. higher than some torches secure from high test gasoline. To secure efficient combustion, the torches rely not only upon holes in the burner tubes, but also upon an adjustable bell-shaped inlet placed in front of the needle valve, which may be regulated according to the volume of air required. The air is also admitted along slots on top of the burner tubes immediately above the baffle, these slots serving both to deflect the flame downward against the baffle and to provide additional oxygen. Aside from the efficient combustion secured, this construction is said also to protect the torch securely against blowing out during windy weather or when subjected to strong drafts.

To insure serviceability in the torches when in the hands of ignorant or careless persons and to prevent such persons from injuring the equipment by tampering, the shut-off valve and the fuel valve are separated and the needle valve is provided only with a small thumb nut control, making it practically impossible for the operator to enlarge the orifice through carelessness and confining the use of the larger wheel solely to that of opening and closing the fuel line. As the latter valve has a positive seat there is no occasion to use force on this wheel. These torches are being built in a variety of sizes and types and are known as the Master Torches. They are products of the Turner Brass Works, Sycamore, Ill.



The Double Jet Hot Blast Torch With Cut-Away Sections to Show the Details

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The Grand Trunk has contracted with the General Railway Signal Company for the installation of an electric interlocking plant at its crossing with the Michigan Central at Charlotte, Mich. The plant will consist of a 28 space d.c. Model 2 unit lever interlocking machine. Model 5 switch machines, Model 2-A high signals and Model 3-A dwarf signals will be used and complete detector, route and approach locking will be provided. This road has also placed an order with the same company for automatic block signals and other material to be used in signaling approximately 12 miles of double track between Yarmouth, Me., and Portland. The signals are to be Model 2-A, d.c. base of mast type. This order also includes Model 5, low voltage switch machines, desk circuit controllers and materials necessary for remotely operating five switches.

EDITORIAL

Railway Age

The Table of Contents Will Be Found on Page 5 of the Advertising Section

Developing Real Team-Work

The railways and the telephone companies have much in common, both as to their relations with the public and with the employees. The telephone companies have been eminently successful, particularly since control of their properties was turned back to them by the government after the war, in securing the hearty co-operation of the employees and in building up a fine spirit of team-work. Vice-President E. K. Hall, in charge of personnel and public relations for the American Telephone & Telegraph Company, has performed a signal service to the railroads in talking so frankly before the New York Railroad Club about the experiences of the telephone companies in securing the interest and co-operation of their workers. The address is reproduced in part elsewhere in this issue. It is not a theoretical discussion—it deals with the principles and methods which have been applied with eminently practical results. These, because of the similarity of conditions under which the telephone companies and railroads operate, should be fully as applicable to the latter as to the former.

Automobile Accidents Will Increase

One thousand two hundred sixty-two people were killed and 4,025 injured during 1921 as a result of automobile-train collisions at grade crossings. That year witnessed an increase from 10,700,000 to 12,975,632, or 24 per cent, in the number of licensed automobiles, an important reason for the increase in the number of killed and injured. Road betterments will insure a similar increase in cars for the following years and fatalities may likewise be expected to increase unless some action is taken to remove the cause or to introduce some effective preventive for automobile-train accidents. The only method which would eliminate all grade crossing accidents is to provide for a separation of grades at all crossings. This would involve an expenditure of such stupendous proportions that no matter how financed would place a burden on the people of this country too heavy for them to bear. Moreover, the separation of grades at all intersections, even if it were economically feasible, would entail such a long construction period that many years would pass before any appreciable influence would be exerted on the number of grade crossing accidents. If any immediate relief is to be obtained from this waste of human life, it must be sought in some other direction, and this has commonly taken the form of admonition for the exercise of watchfulness at railroad crossings by those who have occasion to use the highways. But to carry on any campaign by the railroads looking for the increase of safety at grade crossings through the observation of ordinary precautions by the automobile driver has for its first requisite that they go to the public with clean hands. The railroads must be able to show that they have done all that can reasonably be expected of them to aid the automobilist in his efforts to "cross the crossing cautiously." They must provide adequate signs indicating the presence of the crossing; they must maintain the roadway over the track in condition for travel; they must exercise the necessary supervision over their employees which insures that they do their full duty in warning of the approach of trains; they must do everything in their power to remove unnecessary obstructions from the view of the track. When this has been done to the fullest measure the railroads will be able to come before the public in good faith with a plea for greater care on the part of pedestrians and automobile drivers. But the work must go on. The American Railway Association has undertaken a campaign of education to this end and the railroads must participate individually if anything like success is to be obtained. No time is more opportune than the present.

Picturing Train Operation

A recent issue of the Railway Gazette (London) describes a somewhat novel system of "train control" in use in a congested area on the North Eastern section of the London & North Eastern Railway. The purpose of the system is to give the "control" office a vivid picture at all times of the operation of trains on the line, the utilization of passing tracks and other facilities, etc. The method of accomplishing this is by the use of a large, detailed diagram board which shows all tracks, stations and other facilities and the location of all trains. To picture trains in motion, five endless belts moving in either direction at different speeds are provided. Each train is represented by a card, giving its number, etc., which rides in a carrier attached to the particular belt which moves at a speed between the points on the board approximating the schedule time of the train between those points on the line. At certain designated points the arrival of trains is reported to the control office and the card representing the train is advanced or moved back on the belt if necessary. It is said, however, that little changing of position of these cards is required. The board gives an up-to-the-minute picture of this section of the railway at all times and with it no important details can be overlooked by the "controllers." Consequently the highest degree of utilization of facilities and the greatest efficiency in train movement are made easier to secure.

Fuel Wastes in Small Boiler Rooms

Wasteful methods of burning fuel are frequently found in small railway boiler rooms where the loss of fuel is considered relatively unimportant. These fuel wastes are large in the aggregate, however, and if stopped will save the railroads large amounts of money annually. In a specific case, the fuel cost per kilowatt-hour was abnormally high in a small plant equipped with water tube boilers of about 800 horsepower total capacity. Investigation showed extremely bad operating conditions. With no soot blowers, the tubes could be cleaned only once a month at washout time, and in the interim soot accumulated on the water tubes, proving an effective insulation against the hot furnace gases; the economizer tubes also could not be readily cleaned; no thermometers were available to show feed-water temperatures and therefore give an indication of the economizer efficiency; absence of a pyrometer made the number of degrees superheat attained uncertain; with no draft gage, the draft was regulated en-